# S·A·E Journal

Published Monthly by The Society of Automotive Engineers, Inc.

Arthur Nutt, President — David Beecroft, Treasurer

John A. C. Warner, Secretary and General Manager

Norman G. Shidle, Executive Editor


## About Authors

■ N. L. ALISON'S *experience with hydraulic couplings began in 1932 when the American Blower Corp., with which he has been affiliated for 30 years, obtained exclusive rights to the Vulcan-Sinclair patents in the United States for industrial and marine hydraulic couplings. At that time, American Blower organized the Hydraulic Coupling Division and appointed Mr. Alison general manager, the post he now holds. Much of his work has been in connection with the design of hydraulic couplings for all classes of service.*

■ A. A. CATLIN *is assistant head of mechanical engineering department No. 3 at General Motors Research Laboratories, which deals with the design and development of diesel engines. He has been in that department for the past five years, and a member of the GM Research Laboratories' staff since 1925. Mr. Catlin received his B.S. degree in Mechanical Engineering from Michigan State College in 1923, having had about two years as a designer of light machinery and small tools before completing his course. For two and a half years before joining GM, he was in the experimental department of Continental Motors Corp.*

■ J. E. JACKSON *has been carrying on research in special problems related to diesel-engine cylinder liners in the Caterpillar Tractor Co.'s engineering research laboratory since 1938. At present he is specializing on studies related to surface coatings, wear, diesel-engine heat flow, and corrosion. Mr. Jackson joined Caterpillar soon after receiving his B.S. degree in Electrical Engineering from Oregon State College with the Class of '37.*

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■ ARTHUR W. POPE, JR., *(M '25) is research engineer for the Waukesha Motor Co., makers of the C.U.E. engine. He also is a member of the SAE group which designed and developed the engine. Mr. Pope took an academic course at Yale University before earning his*

(Concluded on page 36)


C. B. Whittelsey, Jr., Business Manager,
29 West 39th St., New York, N. Y.

E. L. Carroll, Eastern Advertising Manager,
29 West 39th St., New York, N. Y.

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2-136 General Motors Bldg., Detroit, Mich.

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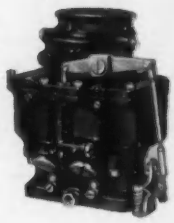
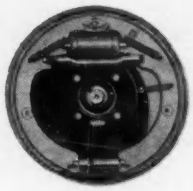
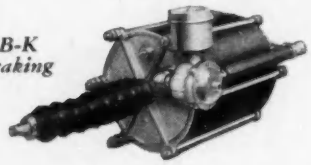


*The Bendix Brake*



*Bendix B-K Power Braking*



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# BENDIX *Products*

# SAE-QMAC Recommends Truck Standards

THE work of the SAE-QMC Advisory Committee on projects so far assigned to it by The Quartermaster-General is virtually complete.

More than 120 recommendations for standardization have been transmitted to the Army and there remains on the Committee's agenda only a corporal's guard of items on which, it is anticipated, final action will have been taken before this informal report is published.

## ■ Wide Scope Covered

The Committee's recommendations apply only to equipment purchased by the Quartermaster Corps and in the main to the ½-, 1½-, 2½-, 4- and 6-ton trucks. The scope of the recommendations is indicated by the items which are listed on page 15, on which final action has been taken by the Committee. Items on which the Committee recommended against standardization are not included in this list. It should be clearly understood that these recommendations represent the advice of the Committee to The Quartermaster-General and that the final decision on their adoption rests with him.

The objective of the Committee's work was to simplify the Army's parts supply problem by providing, in so far as practical, interchangeability of parts among vehicles of the same capacity and among vehicles of different capacities. Because of the Army's pressing need for motor-vehicle equipment, this objective could not be pursued to the ultimate. Consequently, the QMC in selecting the items on which it desired the Committee's advice and the Committee in developing its recommendations on these items, kept constantly in mind that standardization could not be carried to the point that production would be so disrupted that vehicles vitally necessary to the national defense could not be obtained in time to meet military needs.

Although this opportunity to render technical assistance to the nation and to the military undoubtedly grew out of the close relationships which have been maintained between the Society and the Army ever since the last World War, this project had its immediate inception in conferences between representatives of the Army and the SAE National Defense Committee during the 1940 SAE Summer Meeting at White Sulphur Springs, W. Va. As a result of these conferences, a request for the cooperation of the Society in effecting standardization on military motor vehicles was received from Major-Gen. Edmund B. Gregory, The Quartermaster-General. This request was accepted by the SAE National Defense Committee to which the SAE Council had delegated broad powers to carry on such work. Major-Gen. Gregory designated Lt.-Col. M. V. Brunson, who had carried on the initial discussions with the Society, as his representative in the prosecution of the work.

A meeting of the SAE National Defense Committee was held during the last week of June to set up the necessary organization and get the work started. At this meeting Lt.-Col. Brunson submitted a list of items on which the QMC desired the Committee's advice. These items were classified under the following headings: Body, Chassis, Electrical, Engine, and Transmission and Axle. Consideration was then given to the organization needed to develop the recommendations under these headings.

## ■ Speedy Procedure Adopted

There were two possibilities: Groups could be formed on which all interested parties would be represented, or small groups of competent engineers could be organized which would study the problem, develop tentative recommendations, circulate these tentative proposals to the industry and, on the basis of the comments received, formulate final recommendations. Because of the pressing need for speed, the latter procedure was adopted.

The SAE-QMC Advisory Committee was then organized. It consists of a chairman, two members-at-large, and the chairmen of the Body, Chassis, Electrical, Engine, and Transmission and Axle Subcommittees. Each of the sub-

committees consists of a chairman and two members. The subcommittees were authorized to secure the advice of other engineers and to organize sub-groups as might be necessary. As the organization chart on the following page indicates, this authority was freely used.

The next step was to hold an initial meeting of the Committee and its subcommittees. This meeting was held in Detroit and vehicle suppliers were invited to send representatives to it. At this meeting, the project was explained, the organization was described, and each supplier was requested to designate one man in his organization to function as the point of contact with the Committee.

## ■ Subcommittees Go To Work

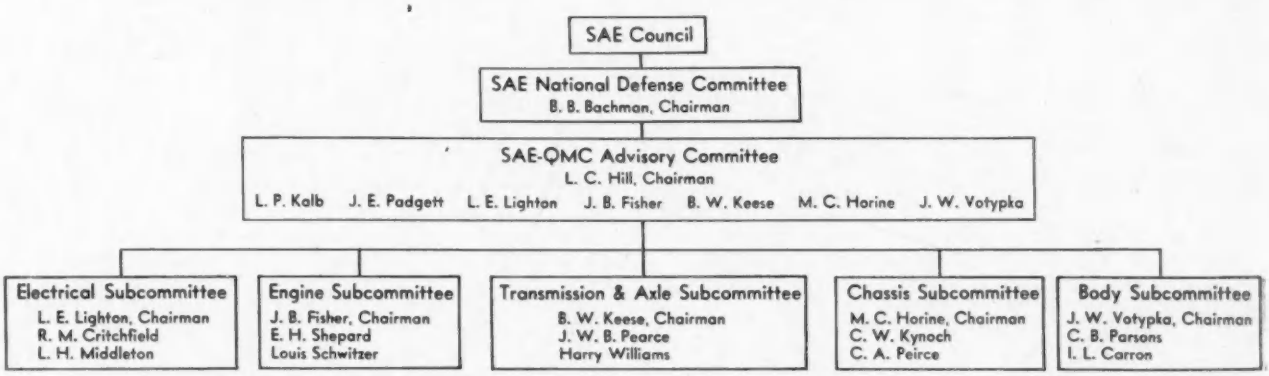
The subcommittees then went to work, holding meetings as necessary. Tentative recommendations, as they were developed, were forwarded to SAE headquarters where numbers were assigned to them. Then the recommendations were circulated to the industry for comment. Initially two weeks were allowed for the return of comments but later it was necessary to reduce this time to ten days to speed up the procedure. When the comments were received they were turned over to the subcommittees for consideration. In some cases, the subcommittees decided that the original proposals should stand; in others revisions were made to meet criticisms contained in the comments received from suppliers. In a few cases, revised proposals were recirculated to suppliers for comment.

When subcommittees had the recommendations in final form, they were submitted to the SAE-QMC Advisory Committee. In presenting recommendations, subcommittee chairmen outlined the background of each proposal and analyzed the comments received from suppliers. The SAE-QMC Advisory Committee then acted on the proposal. In most cases, it approved subcommittee proposals. In some cases, however, it directed that modifications be made. In other cases it rejected the proposals, and in still other instances it returned them to the subcommittee for further consideration. Recommendations approved were then transmitted to The Quartermaster-General as the recommendations of the SAE-QMC Advisory Committee.

The work of the Advisory Committee and of the subcommittees was closely followed by Lt.-Col. Brunson. In order to maintain closer contact with the work, he was transferred to Fort Wayne in Detroit for several months. As a result he attended all meetings of the Advisory Committee and practically all subcommittee and sub-group meetings. Consequently, as the work went along, he was able to give the various meetings the benefit of the military viewpoint, which was of inestimable value. In a number of cases tentative proposals were modified before circulation to suppliers on his advice thus preventing lost motion. In all cases, he approved circulation of proposed recommendations to the industry for comment. This approval of proposals for circulation should not be taken to mean adoption by the Army because, as stated previously, final decision on this rests with The Quartermaster-General.

## ■ Interchangeability Sought

All recommendations are directed at securing interchangeability. In general, they do not include quality or performance requirements. The exceptions involve items where certain minimum performance standards had to be established in order to permit interchangeability. In some




IN order to handle the detail of its work, the ELECTRICAL SUBCOMMITTEE organized the following sub-groups: **Sub-Group on Instruments, Switches, Lights, etc.:** L. H. Middleton, chairman; Instruments and Switches: E. F. Webb, chairman, A. M. Babitch, E. F. Bacon, A. A. Bluemle, A. W. LeFevre, T. G. Moulding, F. G. Whittington; Spark Plugs: E. S. Twining, chairman, R. K. Christie, Hector Rabezzana; Lights: H. C. Mead, chairman, R. W. Johnson, Val J. Roper. **Sub-Group on Starting, Lighting and Ignition:** R. M. Critchfield, chairman, L. B. Ehrlich, B. M. Leece, August Toelle. **Sub-Group on Batteries:** L. E. Lighton, chairman, C. J. Dempwolf, Ralph Seabury, L. E. Wells, H. D. Wilson. Others who advised the Electrical Subcommittee at various stages of its work included: K. A. Eger, H. C. Riggs, W. C. Wooten, C. H. Endress, G. L. Kyle, C. W. McKinley, E. E. Bitter, E. W. Meranda, J. T. Fitzsimmons, and D. L. Wertz.

Among those who advised with the BODY SUBCOMMITTEE at various stages of its work were: A. A. Bluemle, R. D. Buick, G. D. Cloutier, B. Floraday, J. G. Joachim, A. V. Krump, G. F. Robarge, M. A. Solomon, A. W. Susor, W. E. Arnold, H. P. Schade, P. E. Stone, William H. Colbert, R. F. Miller, E. Redman, H. W. Mackey, M. L. Brown, R. A. Mackie, J. F. Wilson, O. L. Sickert, P. W. Trier, C. J. Brophy, H. W. Rightmyer, H. M. Davidson, E. L. Allen, A. L. Johnson, Seth Atwood, A. H. Erubler, J. W. Cramer, and H. V. Rohm.

Among those who advised with the CHASSIS SUBCOMMITTEE at various stages of its work were: Burns Dick, H. D. Stecher, Stephen Johnson, Jr., C. E. Gable, R. P. Gibson, C. M. Hyde, P. J. Reese, and W. B. Paine.

*(Wide World Photo)*

**Major-Gen. Edmund B. Gregory, Quartermaster-General, U. S. Army, at whose request the SAE-QMC Advisory Committee was established to aid in effecting standardization of military motor-vehicle parts**

few cases larger sizes are recommended than may be necessary on some of the smaller vehicles but this was unavoidable if the needs of the larger vehicles were to be met.

The work of the Committee has been facilitated by the patriotically cooperative attitude exhibited by all involved. Manufacturers have been most generous in making their engineers available as well as prompt in sending in their comments on proposed recommendations. Committee members have also been most generous of their time in attending the many meetings which have been held and in carrying on the necessary "between-meetings" work of the groups to which they belong.

Altogether a total of more than 100 engineers, including Committee, Subcommittee and Sub-Group members and those who advised on particular phases of the work, participated in the activity of the Committee. About sixty meetings of the various groups were held, and delegations attended Army maneuvers last summer to study the military transport problem at first hand.

Although work of the Committee is about complete on items so far assigned to it by The Quartermaster-General, present indications are that it will be continued in existence so that it will be ready to function expeditiously should any further requests for its services be received from The Quartermaster-General.

■ ■ ■

## Suggested Army Truck Standards

**RECOMMENDATIONS already submitted in final form to The Quartermaster General affect the following items:**

- Outside door handles
- Window regulator handles
- Remote control handles
- Door dovetails
- Door hinges
- Door checks
- Cab door locks
- Remote controls
- Windshield wipers
- Rear-view mirrors
- Radiator caps
- Gasoline-tank caps
- Radiator hose
- Radiator drain plug
- Gasoline-tank outlet connection
- Gasoline-tank drain plugs
- Chassis lubrication systems
- Battery cables
- Air-brake hose fittings
- Air-brake tubing
- Hydraulic-brake hose
- Hydraulic-brake rear-axle tee
- Battery installation
- Blackout switch
- Panel lamp switch
- Ignition switch
- Headlight dimmer switch
- Throttle and choke controls
- Dash instruments
- Horn
- Blackout lighting equipment
- Generator and lighting voltage
- Generator rating
- Voltage regulators
- Ignition coil
- Distributor caps
- Distributor rotors
- Distributor circuit-breaker lever
- Condenser and stationary contact support
- Starting motor drives
- Series-parallel starting switch
- Wiring code
- Terminal sizes
- Reflex reflectors
- Stop light switches
- Batteries and cradles
- Cooling fans
- Fan belts
- Engine thermometer connection
- Oil-gage connection
- Carburetor flanges
- Air horns
- Throttle connections
- Gasoline carburetor connections
- Oil filler caps
- Intake-manifold vacuum connection
- Oil-pan drain plug

*(A few more recommendations remain to be put into final form)*

■ ■ ■

# SAE ANNUAL MEETING

And

## Engineering Display

**JAN. 6-10 • DETROIT**

**BOOK-CADILLAC HOTEL**

### MONDAY, JAN. 6

#### TRANSPORTATION & MAINTENANCE

**10:00 A.M.** — **G. W. Laurie, Chairman**

Characteristics of Exhaust Gas Analyzers
– ***J. L. Dilworth, Pennsylvania State College***

#### AIRCRAFT

**10:00 A.M.** — **Peter Altman, Chairman**

The M.I.T. Wright Brothers Wind Tunnel and Its Operating Equipment
– ***Prof. John R. Markham, Massachusetts Institute of Technology***

Effect of Opposite Rotating Propellers on Static Longitudinal Stability
– ***C. W. Scott, N. B. Moore and L. B. Rumph, St. Louis Airplane Division, Curtiss-Wright Corp.***

#### TRUCK, BUS & RAILCAR

**2:00 P.M.** — **B. F. Jones, Chairman**

Significant Structural Developments in Motorcoach Design
– ***M. C. Horine, Mack Mfg. Corp.***

#### AIRCRAFT

**2:00 P.M.** — **J. G. Lee, Chairman**

Outline of a General Approach to the Flutter Problem
– ***S. J. Loring, Vought-Sikorsky Aircraft***

Visualized Airflow
– ***Roger W. Griswold, II, Aerodynamic Consultant***

#### JUNIOR-STUDENT

***Auspices Detroit Section***

**8:00 P.M.** — **A. C. Staley, Chairman**

Made in America Substitutes
– ***H. W. Gillett, The Battelle Memorial Institute***

### TUESDAY, JAN. 7

#### TRUCK, BUS & RAILCAR

**10:00 A.M.** — **R. S. Reed, Chairman**

Toll Roads and Truck and Bus Transportation
– ***Charles M. Noble, Pennsylvania Turnpike Commission***

#### AIRCRAFT ENGINE

**10:00 A.M.** — **N. N. Tilley, Chairman**

Compounding Facts and Fallacies
– ***F. L. Prescott, U. S. Army Air Corps***

Aircraft Cylinder Finishes
– ***Myron A. Coler, Paragon Paint & Varnish Corp.***

#### TRANSPORTATION & MAINTENANCE

**2:00 P.M.** — **T. L. Preble, Chairman**

Brake Equalization Problems
– ***J. W. Votypka, Fruehauf Trailer Co., and A. Vance Howe, Bendix Westinghouse Auto Brake Co.***

#### AIRCRAFT ENGINE

**2:00 P.M.** — **Robert Insley, Chairman**

Modern Aircraft Engine Testing
– ***W. D. Gove, Pratt & Whitney Aircraft***

Powerplant Wind-Tunnel Testing
– ***W. C. Rockefeller, Vultee Aircraft Corp.***

Some Factors Influencing the Performance of Diaphragm Indicators of Explosion Pressures
– ***F. R. Caldwell and E. F. Fiock, National Bureau of Standards***

#### BUSINESS SESSION

**8:00 P.M.** — **President Arthur Nutt in the Chair**

#### PASSENGER CAR

**8:15 P.M.** — **J. C. Zeder, Chairman**

Motor Transportation in the National Defense Program
– ***Major-Gen. E. B. Gregory, Quartermaster General***

The SAE's National Defense Program
– ***B. B. Bachman, Chairman SAE National Defense Committee***

### WEDNESDAY, JAN. 8

#### ORDNANCE

**10:00 A.M.** — **Col. H. W. Alden, Chairman**

The Development and the Employment of the Armored Force
– ***Major-Gen. C. L. Scott, The Acting Chief of the Armored Force***

## AVIATION

**2:00 P.M.** — **T. P. Wright, Chairman**

The Air Corps' Program in National Defense
– ***Major-Gen. G. H. Brett, Chief of the Air Corps***

The Navy's Program in National Defense
– ***Rear Admiral J. H. Towers, Chief of Bureau of Aeronautics***

## ANNUAL MEETING DINNER

**6:30 P.M.**

L. A. Chaminade, Chairman Detroit Section

L. C. Hill, Toastmaster

Arthur Nutt, President SAE

A. T. Colwell, President-Elect

**Address by**

Sir Louis Beale, K.C.M.G., C.B.E., LL.D.
Member of The British Purchasing Commission

***(Limited to SAE members and applicants)***

# THURSDAY, JAN. 9

## DIESEL ENGINE

**10:00 A.M.** — **L. C. Lichty, Chairman**

***Instrumentation Symposium***

The Requirements of a Smoke Meter
– ***Kenneth M. Brown, Caterpillar Tractor Co.***

The Development of a Cetane Valve for Rating Fuel Ignition Quality
– ***W. H. Browne, Caterpillar Tractor Co.***

A Procedure for Determining Diesel Nozzle Spray Characteristics
– ***Harry F. Bryan, International Harvester Co.***

Two Devices for Improving Laboratory Precision
– ***L. W. Griffith and E. R. Willerth, Shell Oil Co.***

A Method for Measuring Diesel Fuel Ignition Lag
– ***W. S. Mount, Socony-Vacuum Oil Co.***

A Dual-Scale Vernier Tachometer
– ***H. V. Nutt and W. F. Joachim, U. S. Naval Engineering Experiment Station***

The Use of the Oscillograph in Testing Diesel Injection
– ***Prof. P. H. Schweitzer, Pennsylvania State College***

The Rose Indicator
– ***Prof. G. C. Wilson, University of Wisconsin***

## PASSENGER CAR

**10:00 A.M.** — **E. H. Smith, Chairman**

***Wide-Base-Rim Symposium***

Wide Base Tire and Rim Construction
– ***Sidney M. Cadwell, United States Rubber Co.***

Rim Width as Affecting Lateral and Torsional Tire Stability
– ***F. H. Comey, B. F. Goodrich Co.***

Effect of Rim Width on Car and Tire Performance
– ***R. D. Evans, Goodyear Tire & Rubber Co.***

Development of Wide Rim Tires for Passenger Cars
– ***E. A. Roberts, Firestone Tire & Rubber Co.***

## DIESEL ENGINE

**2:00 P.M.** — **C. G. A. Rosen, Chairman**

The Status of the Automotive Diesel
– ***Prof. E. H. Fezandie, Stevens Institute of Technology***

Diesel Engines for the Navy
– ***Lt.-Com. M. M. Dana, U. S. Navy***

## PASSENGER CAR

**2:00 P.M.** — **K. M. Wise, Chairman**

***Synthetic Materials***

Rubber
– ***L. B. Sebrell and R. P. Dinsmore, Goodyear Tire & Rubber Co.***

Metals
– ***Zay Jeffries, General Electric Co.***

## PRODUCTION

**8:00 P.M.** — **E. R. Smith, Vice President Production Activity**

**K. T. Keller, Chairman**

Special Problems in Mass Production of Automotive Defense Equipment
– ***William S. Knudsen, National Defense Advisory Commission***

***An "Off-the-Record" Session with our own "Bill" Knudsen***

# FRIDAY, JAN. 10

## FUELS & LUBRICANTS

**10:00 A.M.** — **J. B. Macauley, Jr., Chairman**

A 13-Year Improvement in Mixture Ratios
– ***W. G. Lovell; J. M. Campbell; B. A. D'Alleva, and P. K. Winter, General Motors Research***

The 1940 Cooperative Road Knock Tests – A Report from the Cooperative Fuel Research Committee
– ***J. M. Campbell, General Motors Research***

*(Annual Meeting Program Concluded on Next Page)*

## Annual Meeting Program

*(Concluded from preceding page)*

### PASSENGER CAR BODY

**10:00 A.M.** — **John Oswald, Chairman**

Color Research and Its Relation to One Phase of the Automotive Industry
**– W. H. Beck, Sherwood Brothers**

### FUELS & LUBRICANTS

**2:00 P.M.** — **Neil MacCoull, Chairman**

Engine Design Versus Engine Lubrication
**– R. J. S. Pigott, Gulf Research & Development Co.**

Lubrication of Severe-Duty Engines (Diesels)
**– J. G. McNab; W. C. Winning; B. G. Baldwin, and F. L. Miller, Standard Oil Development Co.**

### STANDARDS

**2:00 P.M.** — **E. F. Davis, Chairman**

#### *Steel Metallurgy*

Use of Hardenability Tests for Selection and Specification of Automotive Steels
**–A. L. Boegehold, General Motors Research Labs.**

A Method for Hardenability on Small Sizes
**– F. E. McCleary and R. Wuerfel, Chrysler Corp.**

Determination of Specific Hardenability of Shallow-Hardening Steels
**– O. V. Greene and C. B. Post, Carpenter Steel Co.**

Correlation Between Jominy Test and Quenched Round Bars
**– M. Asimow, W. F. Craig, and M. A. Grossmann, Carnegie-Illinois Steel Corp.**

ANNUAL MEETING REGISTRATION FEE

| | |
|---|---|
| ***Non-Member Guests*** | **$2.00** |
| ***Members, Applicants, and Students*** | **No Fee** |

(No Registration Fee Required for Engineering Display)

# MAGNAFLUX Indications Rated by Proposed Method

A SHORTHAND method of designating the size, number, and arrangement of magnaflux indications on the basis of one square foot of surface, and methods of recording the pattern by means of a sensitized paper and Scotch tape are submitted by the Iron and Steel Division of the SAE Standards Committee as Proposed SAE Recommended Practice. The methods are proposed for adoption and publication in The SAE Handbook as a part of the standard steel composition and supplementary data comprising the SAE Standards for Steels and Irons.

This practice provides a common language to those interested in magnaflux inspection and establishes a means of making records which can be used as a basis for mutual understanding. It does not restrict the choice of sample or number of samples, nor does it attempt to interpret the magnaflux pattern.

Magnaflux inspection, as one means of judging the quality of steel, is used by producers, fabricators, and consumers. Each is concerned with the metallic inclusions which will be present on or close to the surface of the finished part. It is desirable, therefore, to have means for expressing and recording the magnaflux patterns.

Following is the proposed SAE Recommended Practice for rating magnaflux indications:

THE proposed rating system is a simple code whereby the number, length, and distribution of the magnaflux lines may be expressed on the basis of a square foot of surface examined, regardless of the size of the sample. In general, it is suggested that, for convenience in handling and counting, the sample should be not less than 5 in. long.

The rating system is not intended as a direct index of quality, but rather as a shorthand description of the indications observed on the surface of the sample.

### ■ Code Factors

(1) The total number of lines per square foot;
(2) The aggregate length of all the lines per square foot;
(3) The length (inches) of the longest single line;
(4) A letter, *A*, *B*, *C*, or *D* indicating the uniformity of distribution.

The length of the longest line is given to the nearest 0.1 in., and the aggregate length to the nearest inch.

The letter *A* indicates uniform distribution, *B* a slight tendency toward grouping, *C* an arrangement of discernible groups, and *D* indicates well-defined or concentrated groups or clusters.

To distinguish indications of exceptionally heavy nature, the letter *H* may be added to the figure giving the length of the longest line, Item (3). In case the average lines rather than only the longest line, might be heavy, the letter *H* might be added to the aggregate length of all the lines, Item (2).

Indications of "pepper-and-salt" nature less than 0.1 in. in length are not to be counted as lines but are regarded as background and, unless in large numbers, will be disregarded. When in large numbers, their presence will be mentioned after the form rating items by appropriate descriptive words.

Where indications of less than 0.1 in. length occur in "ranks," or strung out end to end, they will be counted as lines whenever the spaces of interruptions between them are less than 0.1 in. across. When the spaces or interruptions are more than 0.1 in. across, these short indications will be disregarded.

## Example

The accompanying facsimile of the magnaflux lines as they appear on a sample of steel bar serves to explain the use of the suggested system of rating.

The number of lines found on the sample is 42. This, multiplied by the ratio $1/0.25 = 168$ for the total number of lines per sq ft. (Actual size of the sample area is 6x6 in.; it has been reduced in the illustration.)

The total length of all the lines on the surface of the sample is 5 in. The sample had an area of 0.25 sq ft. The aggregate length of all the lines per square foot then would be $5 \times 1/0.25 = 20$ in.

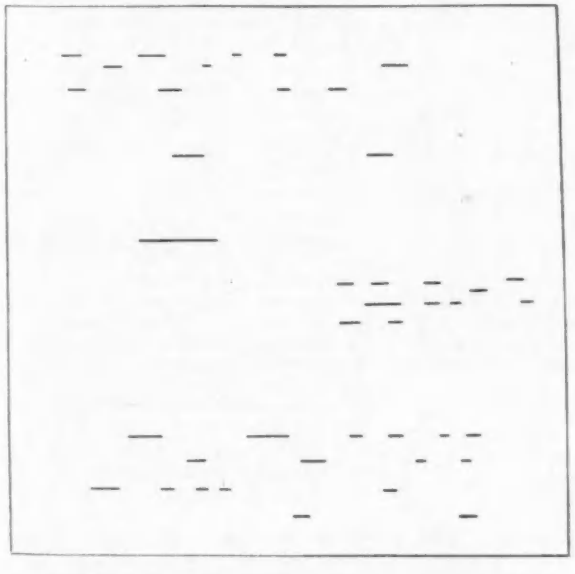
The longest line appearing on the surface is approximately ¾ in. in length so the third number of the code group would be 0.7. If this line were heavy, the third number of the code group would have *H* affixed, thus: 0.7*H*.

By examination, the lines are found to be arranged in distinct groups. The symbol *C* should, therefore, be used to describe the distribution of the lines on the sample.

Thus, the code number to express the appearance of the lines observed on this sample would be:

$$168 - 20 - 0.7H - C$$

**The original sample facsimile, shown reduced in this illustration, is 6 x 6 in. in size**



**Magnaflux lines as they appear on a sample of steel bar used as an example to explain suggested rating system**

## Discussion

By this code, a brief, concise expression carries a considerable amount of information:

(1) There were magnaflux indications occurring at the rate of 168 per sq ft of area.

(2) The aggregate length of all the lines per sq ft of area was 20 in.

(3) The longest line was approximately ¾ in. long and was a heavy line.

(4) On the specimen, these were arranged in distinct groups.

Analysis of count and length shows further that the average length is $20/168 = 0.119$ in. At least one line (0.7 in.) is much longer than the average. If its length is deducted from the total, then the average length of the remaining 167 lines is 0.115 in. In either case, the average length may be said to be ⅛ in. on the particular sample represented here for example.

## General Recommendations For Sample Preparation, Magnaflux Testing Technique, And So On

1. It is recommended that the standard of acceptance or rejection of material be a matter of agreement between the producer and the user.

2. It is recommended that the method of magnaflux testing employed be representative of the wet continuous method.

3. It is further recommended that:
   a. Not less than 700 and not more than 1200 amp of direct current per inch of sample diameter be used, and that, in no case, should the amount of current used be enough to indicate flow lines if such are present.
   b. Not more than three "shots" be used.
   c. The relay timing should be 1/5 to ½ sec per "shot."
   d. The whole operation of testing, including the three "shots" and the spraying or pouring of the vehicle bearing the magnetic substance over the test piece, consume from 3 to 5 sec.
   e. When using the flowing-on method of applying the vehicle containing the magnetic substance, care should be taken not to continue the application after cessation of current flow.
   f. Uniform suspension of the magnetic substance in the vehicle be maintained.
   g. The concentration of the magnetic substance or paste in the vehicle be maintained between the limits of 1% to 1¾% maximum. This is equivalent to 1 oz, approximately, of magnetic paste per gal of vehicle, and may be conveniently measured with a 100-cc centrifuge tube filled from the nozzle of the hose of the magnaflux machine, demagnetized, and read directly after settling 30 min.

4. It is recommended that the sample or specimen to be tested and examined be as representative as is practicable of the finished part, and it is considered particularly important that:
   a. The diameter be that, or approximately that, of the finished part unless otherwise agreed between producer and user.
   b. The sample or specimen be heat-treated or otherwise prepared to simulate the properties and condition of the finished part.
   c. The specimen or sample have a turned, ground or otherwise prepared finish at least equivalent to 20 micro-in. (r.m.s.).
   d. In all cases the sample or specimen should have a machining operation sufficient to remove all surface defects resulting from forging, rolling, heat-treating and so on.

*General information on the method of recording magnaflux indications by the imbibition-paper process and by the transfer process also is included in the Proposed SAE Recommended Practice submitted by the Iron and Steel Division of the SAE Standards Committee. Although this detailed information is not published herewith, it will be printed in complete form when the Recommended Practice is published in the SAE Handbook, to help the user get the best results in making and recording magnaflux indications.*

# About SAE Members

**C. C. CARLTON** has been named permanent director of the Automotive Committee for Air Defense, which established headquarters in November at 8505 West Warren Ave., Detroit. Members of the committee were listed in the December SAE Journal. Mr. Carlton, who is vice president of the Motor Wheel Corp., has received a leave of absence from his company to take this post, but continues as president of the Automotive Parts & Equipment Manufacturers, Inc.

**HAROLD VANCE,** chairman of the board, Studebaker Corp., has resigned as director of the Machine Tool and Heavy Ordnance Division of the National Defense Advisory Commission.

**FRANK G. ALBORN,** consulting engineer, is in the Office of the Chief of Ordnance, Washington, D. C., as senior civilian

**Frank G. Alborn**
With Ordnance Department

engineer. Formerly chief engineer of White Motor Co., Mr. Alborn since 1937 has been engaged in automotive consulting work with an office in Norwalk, Conn.

**C. G. WILLIAMS,** until recently director of research, The Institution of Automobile Engineers, England, has transferred to the research laboratories of Asiatic Petroleum Co.

**R. P. ANDERSON** of the American Petroleum Institute has been reelected chairman of the Standards Council of the American Standards Association, which is in charge of all ASA technical work.

**H. FLETCHER BROWN** has been advanced from factory superintendent to works manager by the Stearman Aircraft Division, Boeing Airplane Co.

**L. C. GOAD,** who has been general manager of the AC Spark Plug Division of General Motors Corp., Flint, Mich., has been transferred to Detroit as assistant to the GM vice president in charge of the Accessory Divisions.

**O. E. HUNT,** vice president, General Motors Corp., has been elected a trustee of the Automotive Safety Foundation.

**KARL VOLMAR ANDERSON** is designing engineer with Nordberg Mfg. Co., Milwaukee, Wis. He formerly was chief designer, Bolinder & Monktell A-B, Eskilstuna, Sweden.

**W. W. LOWTHER** has been named chief engineer of Donaldson Co., Inc., St. Paul, Minn., succeeding **F. R. NOHAVEC.**

**CHARLES F. KETTERING,** vice president and director of General Motors, has been awarded the 1940 A.S.M.E. Medal "for outstanding inventions and research." Presentation was made last month at the American Society of Mechanical Engineers' Annual Meeting in New York. In the past Mr. Kettering has received the John Scott Memorial Award, the Franklin Medal, the Washington Award, and has been granted honorary degrees by a number of universities and colleges.

**HARVEY MORTON CRONK** has been named assistant chief, Army & Navy Aero Specifications Branch, Production Engineering Section, U. S. Army Air Corps, Wright Field, Dayton, Ohio.

**CLARENCE L. TAYLOR** has been elected vice president in charge of engineering of the Arms-Franklin Corp., Franklin, Pa., designers and builders of steel mill equipment. He previously was vice president in charge of engineering of Aetna-Standard Engineering Co., Warren, Ohio.

**GRANT S. WILCOX, JR.,** formerly tool supervisor, Plymouth Motors Division of Chrysler Corp., Detroit, has been named chief tool engineer.

**EUGENE R. PRITCHARD,** formerly chief engineer of Walker Vehicle, Chicago, is in Washington as engineer with the British Purchasing Commission.

**PAUL L. GILLAN** has recently joined the automotive and industrial engineering consultation staff of Aluminum Industries, Inc. His headquarters will be in Cincinnati, but he will travel to almost every state where large automotive, aviation, and industrial

***To Aluminum Industries, Inc.***

**Paul L. Gillan**

plants are located, contacting companies on parts and castings problems. Mr. Gillan has held important engineering posts with the Lycoming Mfg. Co., H. H. Franklin Co., and American La France Co.

# England Writes . . .

**"As a matter of interest, as I write this letter, there is a terrific air fight in progress over my house; it is misty and the machines are low. It is 2:20 pm and a Sunday afternoon. We seem to be giving the enemy all we've got, both from the air and from the ground. No one around here takes very much notice."**

**Edward Spurr,**
**Managing owner, Spurr Boat Co.,**
**Middlesex, England.**

**" . . . the Horning Memorial papers have been received O.K. I am studying them nights in the air raid shelter . . . it gives me something very nice to do in an otherwise dull place.**

**" . . . You can take it from this side that most of us – at least those of us that give any real thought to the matter – do not want you (the United States) in the war. We want your material help admittedly, but we do not want you actually as a combatant because (a) it will delay your material help to us, and (b) I believe that you will make a better referee, for us and the world in general, to settle up this mess after the war if you have not actually been engaged in it."**

**T. B. Rendel,**
**Asiatic Petroleum Co.,**
**London, England.**

**"Would you be good enough to send my SAE Journals and all correspondence to my works, as the Hun has made my private address impossible to live at. However, in spite of it all, we are getting on remarkably well, but are getting more and more angry every day. Jerry is very shortly going to rue the day when he started this show. I expect a great many stories get through to your country about 'Poor Britain,' but believe me, everybody, down to the smallest child, has his tail up. We people in this country do appreciate very greatly the wonderful backing in material that the U.S.A. is giving us."**

**Henry Weslake,**
**Director, Weslake & Co., Ltd.,**
**Surrey, England.**

**"So far, we have survived the blitzkrieg pretty well, though we often hear assorted rubbish whistling through the air and have had a few large bombs close enough to bounce the house rather heartily. Things have fortunately been rather more quiet the last few nights, but there was a fair amount of noise for a short time about 11:30 pm last night. We heard today that the Jerries dropped four sticks of eight bombs each not so far away, but all fell on open land and the total casualties were several panes of glass and one cat!"**

**F. L. Garton,**
**Asiatic Petroleum Co.,**
**London, England**

**These are excerpts from letters sent to the Society from SAE members in England. The four above were written in November. The same calmness and confidence is reflected in others received.**

**DAVID BEECROFT** has been appointed to represent the SAE on the Convention Advisory Committee for the 12th Annual Safety Convention of the Greater New York Safety Council. The convention will be held in April.

**J. B. MORIARTY,** manager of automotive sales, Canadian Industries Ltd., has had responsibility for transportation sales added to his duties.

**CLAUDE E. MURRAY,** who has been affiliated with Willard Storage Battery Co. for the past 30 years, has been named vice president and general manager of the company, succeeding **S. W. ROLPH,** who has been named vice president of the Electric Storage Battery Co., Philadelphia. Mr. Murray for 11 years has been vice president and general manager of the Willard company's Canadian affiliate, Willard Storage Battery Co. of Canada, Ltd.

**Claude E. Murray**
Willard
Vice President

**S. W. Rolph**
To Electric Storage Battery

**MAJOR WILLIAM A. F. MILLINGER,** U. S. Army, Air Corps Reserves, secretary of the Southern California Section, is temporarily stationed at Wright Field, Dayton, Ohio.

## Production Lags, Says Knudsen

The defense program lags, **WILLIAM S. KNUDSEN** said in addressing the National Association of Manufacturers, Dec. 13, just a week prior to his appointment as director of the Office for Production Management for Defense. "Frankly," he said, "we are not doing anything compared to the forecast of the manufacturers and the Defense Commission in July, and our hoped for production figures for Jan. 1 of 1000 planes a month have to be scaled down by 30% to be correct." Mr. Knudsen argued that the five-day week has cut 20% off our machine time, and asked: "Can't we stop this blackout, this lack of production from Friday to Monday, and get more out of the equipment? . . . The first half of 1941 is crucial," he declared, adding, "after that we are sure to be under way."

### *Takes Defense Post*

**Phillip M. Robinson, chief engineer for the Pennzoil Co., Oil City, Pa., who has been appointed assistant to Dr. R. E. Wilson, head of the petroleum section, raw materials division, National Defense Advisory Commission**

**Granted leave of absence by the Pennzoil Co., Mr. Robinson assumed his new post Dec. 16. His work will be in connection with the refining section of the industry**

The American chemical industry, by judicious planning, can in time meet any emergency which may now be foreseen in rubber supply, **DR. PER K. FROLICH,** director of chemical laboratories, Standard Oil Development Co., stated at the opening of the National Chemical Conference of the American Chemical Society in Chicago last month. "The synthetic rubber industry," he said, "has developed to a point where plant capacity should be available next year for the production of some 50,000 lb per day." He added that this would represent less than 2% of our crude rubber imports.

**E. F. RIESING,** Firestone design engineer for the automotive field, recently spoke on the "Various Applications of Mechanical Rubber-Goods Parts on the 1941 Car Models," before the Ontario Rubber Section of the Canadian Rubber Society.

**JOHN H. PRESTON,** formerly automotive engineer, National Carbon Co., New York, has joined A. E. Friedgen, Inc., of the same city, in a fleet maintenance capacity.

**F. C. BOOTH,** formerly with A. E. Friedgen, Inc., New York, is now affiliated with Eclipse Aviation Division, Bendix Aviation Corp., Bendix, N. J.

**BENJAMIN F. CAPWELL,** formerly special representative, Socony-Vacuum Oil Co., Inc., has been named resale salesman by the company. He will make his headquarters in Jamaica, N. Y.

**RICHARD R. LOVELL,** formerly in the construction department, Illinois Bell Telephone Co., Chicago, has been named motor service foreman.

**KENNETH KASSCHAU** recently was advanced from the post of junior test engineer to assistant project engineer by the Wright Aeronautical Corp., Paterson, N. J.

**FRANK JOSEPH HODER, JR.,** who was retail sales manager, Petrol-Diesel, Inc., Philadelphia, is now affiliated with the U. S. Navy (Bureau of Ships), Washington, D. C.

Yale & Towne Mfg. Co., Stamford, Conn., has appointed **EDGAR R. HERRMANN** as methods engineer. He was design engineer with the Heil Co., Hillside, N. J.

**DR. B. J. LEMON** has been named secretary of the defense committee of the U. S. Rubber Co., New York.

**ARTHUR WILD,** manager of the aircraft-engine division, Continental Motors Corp., Detroit, has been named a vice president of the company.

**A. FRED ANDERSON** recently joined the Thompson Products, Inc., West Coast plant, Bell, Calif., as industrial consulting engineer. He previously was chief engineer of the National Motor Bearing Co., Oakland, Calif.

**JOHN S. TAWRESEY,** assistant chief engineer, SKF Industries, Inc., is a member of a special advisory committee of the American Standards Association formed to consider a standards project on the application of statistical methods of control of materials and of manufactured products. This project is being undertaken at the request of the War Department.

**EDWARD M. GREER,** formerly hydraulic development engineer with Air Associates, Garden City, N. Y., is with Electrol Inc., aircraft division, as assistant chief engineer heading the development of aircraft hydraulic equipment.

**J. W. WHEATLEY,** Sherwood Brothers, Inc., has succeeded **WILLIAM F. MAGUIRE** as secretary of the SAE Baltimore Section. Mr. Maguire recently went to Cambridge, Mass., as regional truck manager for Studebaker.

**FREDERICK C. KROEGER,** who since August has been general manager of the Allison Division of General Motors at Indianapolis, on Dec. 2, was named a vice president of General Motors Corp., according to an announcement by **ALFRED P. SLOAN, JR.,** chairman of the board. Before taking his post with Allison, Mr. Kroeger was general manager of the Delco-Remy Division. He had been affiliated with that organization since 1913, when he joined the Remy Electric Co., a predecessor of the Division.

**PHILIP E. WEST,** formerly affiliated with General Motors, Argentina, S. A., is president of P. E. West Motors, Inc., car dealership in Springfield, Ohio.

### *Advanced by General Motors*

**Frederick C. Kroeger**

## Aircraft Output Up 250%; 1942 Car Models Hoped For

"Aircraft production is very much of a military secret, but I can tell you that the airplane industry's output this year is more than two and a half times that of last year," **J. H. KINDELBERGER,** president of North American Aviation, Inc., and vice president of the Aeronautical Chamber of Commerce, said late in November in a national defense broadcast. He added, "It amounts to more than $600,000,000 and remember, we are only starting."

On the same broadcast, **ALVAN MACAULEY,** chairman, Packard Motor Car Co., and president of the Automobile Manufacturers Association, warned America's civilian population that it might have to forego the pleasure of new models if military demands show a heavy increase. "The industry hopes to be able to keep up production of cars and trucks," he said, "because in modern life civilian mobility is second only to armament as a defense requirement. . . . If it can be done our engineers will incorporate further results of their research in future car and truck models. If that should interfere with the national defense program," he added, "changes will not be made. Automobile progress for civilian use has taken a place behind military needs, and national defense is the industry's Number One job."

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Some 200 men of the automotive and associated industries gathered in Chicago, Nov. 12, to honor **CHARLES A. TILT,** founder of the Diamond T Motor Car Co. and its head for 35 years. The affair was a surprise to Mr. Tilt. He was presented with a scroll, signed by all of the guests, and a scale bronze model of the first Diamond T, a 1905 roadster.

**L. HENIG** is general manager of G. M. & L. Henig Co., New York, aeronautical and financial service. Mr. Henig was chief engineer of Du Bois-Martin Aircraft Corp., Du Bois, Pa.

**R. D. Koenitzer**
Whose affiliation with McCord Radiator & Mfg. Co., was noted last month

Since early in November, **IRVING GEORGE BOHRMAN** has been sales engineer for Perfex Corp., Milwaukee, Wis. He had been assistant chief engineer, Hercules Motors Corp., Canton, Ohio.

**SAMUEL T. ROBINSON,** formerly field engineer with Wright Aeronautical Corp., Paterson, N. J., has been named sales engineer.

**W. REX BRASHEAR** is salesman with the Mac Carthy Motor Co., St. Louis, Mo.

**DAVID A. SHEPARD,** who was technical consultant, International Association (Petroleum Industry) Ltd., London, is in this country as technical adviser to the export order and shipping department, Standard Oil Co. of N. J., New York.

**WILLIAM HUDSON RAGSDALE** since late in November, has been test engineer, aircraft engines, Ford Motor Co., Dearborn, Mich. He formerly was test engineer, marine division, Packard Motor Car Co., Detroit.

**PHILIP B. TAYLOR,** with Wright Aeronautical Corp., Paterson, N. J., since 1922, has been advanced from the post of chief engineer to that of assistant general manager. He is succeeded as chief engineer by **RAYMOND W. YOUNG,** advanced from assistant chief engineer. Mr. Young received the Manly Memorial Medal in 1936. **ARTHUR H. LEAK,** formerly design engineer, has been named assistant chief engineer.

**Philip B. Taylor**

**Raymond W. Young**

**RICHARD B. MAY** has been appointed director of research by the Aeronautical University, Inc., Chicago. He formerly was curator of transportation, Chicago Museum of Science & Industry.

**HENRY EMERSON NORTH, JR.,** has been advanced from his position as student engineer to that of production engineer by the Douglas Aircraft Co., Inc., Santa Monica, Calif.

**WILLIAM NEMOY,** formerly in the production control department, Menasco Mfg. Co., Los Angeles, is production and planning supervisor with American Screw Products, of the same city.

**GEORGE WILLIAM MEGRATH** has left the Mid-Way Garage, Osterville, Mass., to become mechanic with the Boston & Taunton Transportation Co., Boston.

**JOSEPH F. BECK,** formerly draftsman with Transitone Automobile Radio Corp., Detroit, has taken the same position with Briggs Mfg. Co., of the same city.

**ROBERT E. GOTTRON** has been appointed chief experimental engineer by Hercules Motors Corp. He previously was assistant chief engineer, gasoline engine division.

**GEORGE DORSEY EVANS,** formerly assistant aeronautical engineer, ship experiment unit, Naval Aircraft Factory, Philadelphia, has joined the Brewster Aeronautical Corp., Long Island City, N. Y., as aeronautical engineer.

**WALTER EMIL SCHMIDT,** who was designer of auxiliary aircraft engines with Westinghouse Electric & Mfg. Co., Detroit, has become designer for Warner Aircraft Corp., of the same city.

**JOHN LLOYD RICHMOND** has joined The Cooper-Bessemer Corp., Mt. Vernon, Ohio, as test engineer. He was formerly associated with the American Bosch Corp., Springfield, Mass.

**S. A. G. PRIESTLEY,** representative of the Shell Co. of Australia Ltd., Sydney, has been granted leave of absence for the duration of the war to serve in the Royal Australian Air Force.

**H. E. BEYSTER,** for nearly two decades with the General Motors Corp. as building designer, and more recently Detroit commissioner of public works, has purchased the interests of C. A. Handeyside and John Earnshaw in the C. A. Handeyside Construction Co., Detroit. Mr. Beyster has announced that the firm's name has been changed to H. E. Beyster Corp., and that he will be president and general manager. The company specializes as architects and engineers in designing and supervising construction, primarily in industrial fields.

**FRED W. RICE,** Cushman Motor Delivery Co., has been promoted to lieutenant colonel in command of the 2nd Battalion, 132nd Infantry, Illinois National Guard. He is leaving this month for one year of training with the 33rd Division at Camp Peay, Tenn.

**JACK C. VANDERFORD,** formerly with the Perfect Circle Co., Hagerstown, Ind., is associated with the test and engineering section of the Armored Force Board, Fort Knox, Ky.

**JAMES H. SWINDELLS** is test engineer with Ranger Aircraft Engines, Inc., Farmingdale, L. I. He formerly was engine tester with Pratt & Whitney Aircraft, East Hartford, Conn.

**BENJAMIN ROZETT** is chief instructor, automotive electric and motor tune-up department, The Lawson Y.M.C.A., Chicago.

In a message to General Motors' stockholders, Dec. 12, Board Chairman **ALFRED P. SLOAN, JR.,** reported on defense orders totaling in the neighborhood of $400,000,000. Included were orders for Allison airplane engines, diesel engines, machine guns, shells, airplane equipment, trucks, and such miscellaneous equipment as tank gun mounts, cartridge cases, fuses, fire-control equipment, magnetos, motors, and other items of technical nature. Of the Allison airplane engines, which total two-fifths of the total, Mr. Sloan said, "current production schedules are at the rate of 350 engines a month. All of the machinery required is expected to be available by September, 1941, and the plant should be in full capacity operation in a year from now. It is expected that capacity will be about 1000 engines a month at that time."

PROF. **GEORGE J. HIGGINS** has been appointed director of the department of aeronautical engineering at the University of Detroit. He succeeds **PROF. PETER ALTMAN,** who resigned to become chief of technical research, Aviation Mfg. Corp. Prof.

***Heads Aeronautical Engineering***

Prof. George J. Higgins

Higgins was appointed to the University of Detroit faculty in 1928. He earlier had been a member of the staff of the National Advisory Committee for Aeronautics in charge of variable-density wind-tunnel research, and of wind-tunnel design in the Committee's Langley Field Laboratories. He is a graduate of the University of Michigan from which he received his B. S. degree in 1923, and the professional degree of Aeronautical Engineer in 1934.

**W. L. BATT,** deputy commissioner, Industrial Materials Division, National Defense Advisory Commission, addressed the Dinner of the 61st Annual Meeting of the American Society of Mechanical Engineers, New York, Dec. 2-6. Mr. Batt also was featured speaker at the Annual Industrial Conference of New Jersey held in Trenton, Nov. 19.

**DEAN CUMRO** is in the parts list department of Douglas Aircraft Co., Santa Monica, Calif.

**STUART LEHMAN MAU** is making up instruction books for the Cleveland Diesel Engine Division of General Motors Corp. He previously was affiliated with the Johns Conveyor Division of Osborn Mfg. Co., Cleveland.

A book containing essentially all of the papers presented at the Temperature Symposium held in New York a year ago under the auspices of the American Institute of Physics, with the cooperation of the National Bureau of Standards and the National Research Council, soon will be published, according to a recent announcement by Henry A. Barton, director of the Institute. Among SAE members presenting papers at the symposium were: **L. M. K. BOELTER,** University of California; **F. A. BROOKS,** California Agricultural Experiment Station; **GUSTAV EGLOFF** and **CHARLES L. THOMAS,** Universal Oil Products Co.; **LUIS de FLOREZ,** De Florez Engineering Co; and **P. M. ROBINSON,** Pennzoil Co. There will be a reduced prepublication price for orders received prior to Feb. 1 Inquiries should be addressed to the Institute.

**WALTER W. BISHOP, JR.,** who last month was advanced from the post of supervisor of engineering training to personnel manager, Wright Aeronautical Corp., recently addressed a group of SAE student members, their guests, and a number of the faculty at the College of the City of New York. His topic was "Airplane Engine Testing." Later the City College SAE members visited the Wright Aeronautical plant in Paterson, N. J., and were taken on a four-hour trip through the factory.

**JOHN GEORGE MYERS,** formerly diesel theory instructor, Jourden Technical School, Cincinnati, has joined the General Machinery Corp., Hamilton, Ohio, as draftsman, diesel division.

Princeton University has appointed **CHARLES L. TUTT, JR.,** assistant professor of mechanical engineering. Mr. Tutt was previously with Buick as engineer, chassis units division.

**R. B. GRAY,** chief division of mechanical equipment, U. S. Bureau of Agricultural Chemistry & Engineering, and **ELMER McCORMICK,** chief engineer, John Deere Tractor Co., were on the fall meeting program of the American Society of Agricultural Engineers held in Chicago early last month.

**H. R. VICK,** formerly a member of the SAE Student Branch at Ohio State University, is now employed by E. I. du Pont de Nemours & Co. at Memphis, Tenn.

Edward F. Korbel and Worth Colwell, counselors in public relations, New York, have named **NIRAN BATES POPE** head of their recently organized technical publicity department. Mr. Pope formerly was editor of *Automobile Topics* and *Motor World*. More recently he has been in the public relations department of the Automobile Manufacturers Association.

**KANENORI NOMAGUCHI** has been named chief experimental engineer with the Toyota Motor Co., Ltd., Aichiken, Japan. He formerly was designer with Diizerus Kiki Kabushiki Kaisha, Tokyo.

**J. E. SCHIPPER, JR.,** formerly on the editorial staff of *MoTor*, New York, has been appointed technical and service repre-

**J. E. Schipper, Jr.** With National Carbon

sentative for the National Carbon Co. in the Pittsburgh area. Mr. Schipper has been active in the SAE Metropolitan Section, and has been serving on the Governing Board as chairman of the publicity committee.

(*Concluded on page 27*)

**Macy O. Teetor, in charge of research engineering, Perfect Circle Co., whose hobby of song writing produced the popular number, "Lost," a few years ago, has scored again. His most recent composition, "I Saw You First," was selected for publication by the Song Hit Guild in its search for talent among non-professional composers. Mack David, Broadway lyricist, wrote the words. Santly-Joy-Select, Inc., is the publisher.**

**Mr. Teetor is pictured playing the organ at a recent SAE Summer Meeting. In the December 1940 SAE Journal appeared Mr. Teetor's most recent contribution to technical literature, "Load-Carrying-Capacity Phenomena of Bearing Surfaces."**

# SAE AIRCRAFT Material Specifications BROUGHT to 136; MORE IN PROCESS

B. Clements, Chairman
Aircraft Material Specifications Division
SAE Standards Committee

WITH 136 specifications completed and already in widespread use, the Aircraft Materials Division of the SAE Standards Committee is close to the half-way mark in completion of approximately 300 aeronautical material specifications embraced in its present pressing project. The Division, headed by B. Clements, Wright Aeronautical Corp., made available 101 specifications early in 1940 and 35 more in November. So far, more than 150,000 copies of specification sheets have been distributed by the SAE. Many have been exported to foreign countries purchasing American aircraft engines, although the main distribution, of course, has been to domestic producers.

These material specifications are complete enough for direct use in the purchase and acceptance of materials, differing therein from more general SAE Standards for steels, non-ferrous metals, and other materials. So far the specifications have been primarily for materials used by engine manufacturers. The next phase of the program is to get complete coordination between materials used in other parts of the aircraft with those used in the engine.

The project, less than two years old, came into being as the result of the industry's sudden awakening to the need for standardization in this field. Increasing government and commercial orders emphasized the excessive cost and delay incurred by manufacturers because each was using its own set of material specifications – a natural condition in an industry accustomed to comparatively small-scale production. As orders continued to increase the matter became more serious, because manufacturers found it practically impossible to get the amount of material required. Minor specification differences were discovered to be the bottle-neck.

Early in 1939, the Engine Technical Committee of the Aeronautical Chamber of Commerce of America, Inc., organized a subcommittee of metallurgists from the various engine companies to study the situation, and to develop ferrous and non-ferrous metals specifications which would be acceptable to the engine companies. The project entailed considerable organization, distribution, and direction. As the work progressed it became evident that wider distribution of the standards than originally conceived would be desirable, and that other materials would be added to the list.

The Aeronautical Chamber turned to the SAE, because of the Society's long experience in development and distribution of standards, with the suggestion that it continue the work. SAE acceptance was prompt, and final arrangements for the transfer were completed in October 1939. The original subcommittee of the Aeronautical Chamber's Engine Technical Committee was disbanded as such and reassembled, with addition of men representing the Non-Ferrous and Steel Divisions of the Society's Standards Committee.

Serving on the Division with Chairman Clements are: Vice Chairman H. J. Fischbeck, Pratt & Whitney Aircraft, Division United Aircraft Corp.; C. E. Carrigan, Ranger Engineering Corp.; P. V. Faragher, Aluminum Co. of America; F. P. Gilligan, Henry Souther Engineering Corp.; R. L. Heath, Allison Division of General Motors Corp.; J. H. Huff, Curtiss Propeller Division, Curtiss-Wright Corp.; J. B. Johnson, Materiel Division, U. S. Army Air Corps; F. S. Klock, Hamilton Standard Propellers, Division United Aircraft Corp.; H. M. McFadgen, Jacobs Aircraft Engine Co.; J. E. Sullivan, Bureau of Aeronautics, U. S. Navy Department, and R. D. Zonge, Lycoming Division, Aviation Mfg. Corp.

Specifications agreed upon by the SAE Division have the acceptance of aircraft-engine manufacturers and the Army Air Corps. The Bureau of Aeronautics of the Navy Department has accepted all specifications issued to date, although it has not issued blanket approval.

The specifications so far completed have been grouped under the headings of processes, non metallics, aluminum, magnesium, and copper alloys, carbon, corrosion-resistant and low-alloy steels, and accessories, fabricated parts and assemblies.

# NEW MEMBERS Qualified

**These applicants who have qualified for admission to the Society have been welcomed into membership between Nov. 15, 1940, and Dec. 15, 1940.**
**The various grades of membership are indicated by: (M) Member; (A) Associate Member; (J) Junior; (Aff.) Affiliate Member; (SM) Service Member; (FM) Foreign Member.**

### *Canadian Section*

**Gerow, Frank Travis** (A) manager, White Co., Ltd., 605 King St., East, Toronto, Ont.

**Mantle, Thomas O.** (A) service representative, Chrysler Corp. of Canada, Ltd., Windsor, Ont. (mail) 991 Bruce Ave.

### *Chicago Section*

**Conroy, Charles L.** (M) president, development engineer, Anchor Coupling Co., Waukegan, Ill. (mail) Box 256.

**Davies, Wilfred W.** (J) assistant superintendent, engine research, United Air Lines Transport Corp., 5936 S. Cicero Ave., Chicago.

**Elson, Clyde C.** (A) field engineer, U. S. Asbestos Division of Raybestos-Manhattan, Inc., Manheim, Pa. (mail) 142 West Hickory St., Chicago Heights, Ill.

**Gridley, Glenn C.** (M) vice president, works manager, Mechanics Universal Joint Division of Borg-Warner Corp., 2020 Harrison Ave., Rockford, Ill.

**Leahy, James A.** (A) department head, Joseph T. Ryerson & Son, Inc., 16th & Rockwell Sts., P.O. Box 8000A, Chicago. (mail) 805 Wesley Ave., Oak Park, Ill.

### *Cleveland Section*

**Campbell, M. H.** (J) automotive engineer, Standard Oil Co. (Ohio), Chemical Research Dept., Cummington Rd., Cleveland.

**Karr, Walter F.** (J) sales engineer, Fafnir Bearing Co., 7016 Euclid Ave., Cleveland.

**Menz, Paul J.** (A) sales engineer, Ohio Ball Bearing Co., 6531 Euclid Ave., Cleveland.

### *Detroit Section*

**Barrett, James J.** (J) engineering representative, Bishop & Babcock Mfg. Co., Cleveland. (mail) 17725 Manderson Road, No. 409, Detroit.

**Crandall, William J.** (M) engine designer, Packard Motor Car Co., Detroit. (mail) 9936 Balfour Road.

**Hall, Walter L.** (J) draftsman, Yellow Truck & Coach Mfg. Co., Pontiac, Mich. (mail) 53 Belmont.

**Hall, William Edwin** (M) sales engineer, Harris Products Co., 5408 Commonwealth, Detroit.

**Morgan, Robert G.** (J) sales engineer, Timken Roller Bearing Co., 1111 Fisher Bldg., Detroit.

**Splitstone, John Ragon** (J) sales engineer, Timken Roller Bearing Co., 1111 Fisher Bldg., Detroit.

### *Indiana Section*

**Crosby, Frank Miller** (J) assistant instructor, Purdue University, West Lafayette, Ind. (mail) 300 Sylvia St.

### *Metropolitan Section*

**Carpenter, Charles Louis** (J) experimental engine tester, Wright Aeronautical Corp., Paterson, N. J. (mail) 6-02 Morlot Ave., Fair Lawn, N. J.

**Cubbins, William Robert, Jr.** (M) district sales manager, Trailer Co. of America, 3601 Northern Blvd., Long Island City, N. Y.

**Davenport, Edmund S.** (M) Metallurgist, U. S. Steel Corp., Research Lab., Kearny, N. J.

**Draper, Eaton Hamilton** (J) engine tester, Wright Aeronautical Corp., Paterson, N. J. (mail) 602 Morlot Ave., Fair Lawn, N. J.

**Engel, Werner H. E.** (A) 23 Ingraham St., Brooklyn, N. Y.

**Enyart, William R.** (M) general manager, vice president, Simmonds Aerocessories, Inc., 10 Rockefeller Plaza, New York City.

**Hart, Elmer Lawrence** (J) junior engineer, Wright Aeronautical Corp., Paterson, N. J. (mail) 128 Ward St.

**Heaton, Edward Francis** (J) test engineer, Wright Aeronautical Corp., Paterson, N. J. (mail) 410 East 30th St.

**Infortunio, John** (A) bus mechanic, Brooklyn Bus Corp., 39th St. & Third Ave., Brooklyn, N. Y. (mail) 636 Dahill Road.

**Kelley, George S., Jr.** (J) experimental tester, Wright Aeronautical Corp., Paterson, N. J. (mail) 350 Hutchinson Blvd., Mt. Vernon, N. Y.

**Maxwell, Richard B.** (J) test engineer, Wright Aeronautical Corp., Paterson, N. J. (mail) 436 Crown St., Brooklyn, N. Y.

**Neugebauer, George H.** (M) instructor in machine design, Cooper Union, Cooper Square, New York City.

**Rudd, John Krom** (J) junior test engineer, Wright Aeronautical Corp., Paterson, N. J. (mail) 332 18th Ave.

### *Milwaukee Section*

**Jordan, Albert Wesley** (J) experimental engineer, Waukesha Motor Co., Waukesha, Wis.

**Keaton, Don R.** (M) chief engineer, Whirlwind Lawn Mower Corp., Milwaukee. (mail) 730 West Virginia St.

**Stocker, Norman A.** (A) sales representative, Cleveland Graphite Bronze Co., 880 East 72nd St., Cleveland. (mail) 716 East Carlisle Ave., Milwaukee.

**Wothe, Armand W.** (M) experimental engineer, Wisconsin Axle Division of Timken Detroit Axle Co., Oshkosh, Wis. (mail) 232 Algoma Blvd.

### *New England Section*

**Connor, Bernard D.** (M) superintendent of transportation, Boston Consolidated Gas Co., 100 Arlington St., Boston. (mail) 144 McBride St., Jamaica Plain, Mass.

### *Northern California Section*

**Glidewell, Harold C.** (M) service representative, Hall Scott Motor Car Co., Berkeley, Calif. (mail) 1046 Duncan Ave., Yeadon, Pa.

### *Oregon Section*

**Stigum, Tom** (A) superintendent Trailer Shop, Williamette Iron & Steel Corp., 2860 N. W. Front St., Portland, Ore. (mail) North Plains, Ore.

### *Philadelphia Section*

**Bishop, Thomas S., 3rd** (J) diesel engineer, Mack Mfg. Corp., Allentown, Pa. (mail) 735 St. John St.

**Nail, Franklin R.** (J) engineer, special equipment, Mack Mfg. Corp., Allentown, Pa.

**Scharfenberg, C. A.** (J) truck engineer, Mack Mfg. Corp., Allentown, Pa. (mail) 1144 Hamilton St.

### *St. Louis Section*

**Post, Nicholas** (J) draftsman, Key Co. of East St. Louis, East St. Louis, Ill. (mail) 616 Post Place.

### *Southern California Section*

**Gooch, Joel M.** (J) draftsman, Menasco Mfg. Co., 805 E. San Fernando Road, Burbank, Calif. (mail) 1205 N. Isabel St., Glendale, Calif.

**Ryden, Gunnar** (A) 3139 Indiana St., South Gate, Calif.

**Satin, Alexander** (M) 1923-A Washington Ave., Santa Monica, Calif.

**Sharp, F. Herbert** (M) engineer, wing group, Consolidated Aircraft Corp., 3302 Pacific Highway, San Diego, Calif. (mail) 3511 Arnold Ave.

**Weidinger, Alois Martin** (J) chief instructor of engines, Ryan School of Aeronautics, Lindbergh Field, San Diego, Calif.

**White, Paul H., Jr.** (M) assistant to president, Menasco Mfg. Co., 805 E. San Fernando Rd., Burbank, Calif.

**Wilson, O. Kenneth** (A) engineering instructor, Aero Industries Technical Institute, 5245 San Fernando Road, Los Angeles. (mail) 716 N. Howard St., Glendale, Calif.

### *Washington Section*

**Essex, Henry A.** (J) junior mechanical engineer, National Advisory Committee for Aeronautics, Langley Field, Hampton, Va. (mail) 275 La Salle Ave.

### *Outside of Section Territory*

**Cresswell, Wm. A. Jr.** (J) Analytical engineer Aviation Mfg. Corp., Lycoming Division, Williamsport, Pa. (mail) 944 West Fourth St.

**Jester, Curtis M., 2nd Lieut.** (J) motor officer, U. S. Army, Battery H, 15th Field Artillery, Fort Sam Houston, Tex. (mail) 930 Grayson St., No. 5, San Antonio, Tex.

### *Foreign*

**Crockett, Robert John** (F M) works manager, National Motor Springs, Pty., Ltd., O'Riordan St., Alexandria, N.S.W., Australia. (mail) 55 Village High Road, Vaucluse, N.S.W., Australia.

**Doole, George A., Capt.** (M) chief pilot, Avianca, Barran Quilla, Colombia, So. America.

**Godoy, Agustin** (A) salesman, Sinclair Cuba Oil Co., S.A., Calle 12, No. 361, Dept. 2-C, Vedado, Havana, Cuba.

**Smith, Alec Ashton, Lieut.** (A) acting chief inspector, South African Airways, Rand Airport, Germiston, South Africa. (mail) 21 Liddle St., Bertrams, Johannesburg, South Africa.

# APPLICATIONS Received

**The applications for membership received between Nov. 15, 1940, and Dec. 15, 1940, are listed below. The members of the Society are urged to send any pertinent information with regard to those listed which the Council should have for consideration prior to their election. It is requested that such communications from members be sent promptly.**

### *Baltimore Section*

**Bill, Robert George,** American Hammered Piston Ring Division, Koppers Co., Baltimore.

**Burwell, D. A., Jr.,** superintendent of maintenance, Horton Motor Lines, Inc., Baltimore.

**Parker, Edward H.,** draftsman, Glenn L. Martin Co., Baltimore.

**Richardson, James Arthur, Jr.,** aide to superintendent of transportation, Consolidated Gas, Electric Light & Power Co. of Baltimore, Baltimore.

### *Buffalo Section*

**Lynn, Carl DeWalt,** safety engineer, Socony-Vacuum Oil Co., Inc., Buffalo.

### *Canadian Section*

**Davis, Lloyd J.,** district manager, Sealed Power Corp. of Canada, Ltd., Toronto, Ont., Canada.

**Edgar, John Stanley,** Thompson Products, Inc., St. Catharines, Ont., Canada.

**White, William H. C.,** automotive engineer, Sun Oil Co., Ltd., Toronto, Ont., Canada.

### *Chicago Section*

**Burke, Sylvan Eugene,** junior designer, Bendix Aviation Corp., South Bend, Ind.

**Denning, Loren George,** engine tester, Sinclair Refining Co., East Chicago, Ind.

**Greenlee, Harry R.,** engineer in charge of transmission design, Studebaker Corp., South Bend, Ind.

**Hykes, Paul G.,** laboratory engineer, The Studebaker Corp., South Bend, Ind.

**Mandt, Conrad I.,** engineer, International Harvester Co., Chicago.

**Rouse, Ceylon,** engineer, Bendix Products Division, Bendix Aviation Corp., South Bend, Ind.

**Wetzel, Paul W.,** junior designer, The Buda Co., Harvey, Ill.

### *Cleveland Section*

**Bouchez, S. J.,** experimental test and development, Hercules Motors Corp., Canton, Ohio.

**Ford, John Thomas,** draftsman, White Motor Co., Cleveland.

**Jacobus, Harland E.,** engineer, Thompson Products, Inc., Cleveland.

**Manning, Louis,** experimental tester, Hercules Motors Corp., Canton, Ohio.

**Priestman, Bewley D.,** sales department, engineering contact, Hercules Motors Corp., Canton, Ohio.

**Sutherland, Robert Louis,** development engineer, Firestone Tire & Rubber Co., Akron, Ohio.

**Thayer, Lee E.,** experimental test, Hercules Motors Corp., Canton, Ohio.

**Willis, Eldrich J.,** aircraft engineer, Aluminum Co. of America, Cleveland.

### *Detroit Section*

**Adams, Robert L.,** engineer, Barnes-Gibson-Raymond Division, Associated Spring Corp., Detroit.

**Dowlding, William Frederick Stephen,** methods engineer, Long Manufacturing Division, Borg-Warner Corp., Detroit.

**Ellor, James Edwin,** chief development and research engineer, Rolls-Royce, Inc., Detroit.

**Heller, Clifford Milton,** chief engineer, Bingham Stamping Co., Toledo, Ohio.

**Murawsky, Henry,** designer, Fisher Body Division, General Motors Corp., Detroit.

**Turkish, Michael Charles,** engineering draftsman, Wilcox-Rich Division, Eaton Mfg. Co., Detroit.

**Wozniak, Frank B.,** stress analyst, Stout Skycraft Corp., Dearborn, Mich.

### *Indiana Section*

**Brantingham, Paul T.,** assistant chief engineer, International Harvester Co., Fort Wayne, Ind.

**Conron, Thomas William,** tool designer, Chevrolet Muncie Division, General Motors Corp., Muncie, Ind.

**Houghton, Carl R.,** chief engineer, Roots-Connersville Blower Corp., Connersville, Ind.

**Iles, Virgil L.,** junior test engineer, Allison Division, General Motors Corp., Indianapolis.

**Lewis, Vernon H.,** design engineer, J. D. Adams Mfg. Co., Indianapolis.

**Miller, Maurice Henry,** engineer, L. G. S. Spring Clutches, Inc., Indianapolis.

**Stallwood, Charles,** metallurgist, Allison Division, General Motors Corp., Indianapolis.

**Troyer, Melville R.,** blue printer, Chevrolet Muncie Division, General Motors Corp., Muncie, Ind.

### *Metropolitan Section*

**Arias, Antonio, Jr.,** drafting, designing, International Motor Co., Plainfield, N. J.

**Bruce, Donald S.,** division chief, Johns-Manville Corp., Manville, N. J.

**Carrigan, Carlton E.,** Ranger Aircraft Engines Division, Fairchild Engine & Airplane Corp., Farmingdale, L. I., N. Y.

**Cicchetti, Eugene Gildo,** engine draftsman, Breeze Corporations, Inc., Newark, N. J.

**Close, Walter Laird,** experimental test engineer, Wright Aeronautical Corp., Paterson, N. J.

**Da Silva, J. Mendes,** Captain, Brazilian Army Air Corps, Technical Service. mail: 17 Battery Place, New York.

**Effinger, William, Jr.,** president, Berkeley Models, Inc., Brooklyn, N. Y.

**Fraas, Arthur P.,** test engineer, Wright Aeronautical Corp., Paterson, N. J.

**Gray, Harry Cooper,** assistant project engineer, Wright Aeronautical Corp., Paterson, N. J.

**Gross, Robert,** Checker Taxi Corp., New York.

**Holben, Martin M.,** junior test engineer, Wright Aeronautical Corp., Paterson, N. J.

**Horwath, Albert Stephen,** power plant engineer, Brewster Aeronautical Corp., Long Island City, N. Y.

**Kelley, Albert Charles,** tool designer, Breeze Corporations, Inc., Newark, N. J.

**Kwan, Cho-Shun,** engineer, Universal Trading Corp., New York.

**Patterson, Edward D.,** experimental planning, Wright Aeronautical Corp., Paterson, N. J.

**Ritchen, Ralph,** associate editor, Book Department, MoToR, New York

**Saltzer, Bertram Hanson,** supervisor of engineering training, Wright Aeronautical Corp., Paterson, N. J.

**Schubel, Raymond W.,** tool designer, Breeze Corporations, Inc., Newark, N. J.

**Scott, Robert William,** junior engineer, Wright Aeronautical Corp., Paterson, N. J.

**Short, Joseph V.,** engineer, Standard Vacuum Oil Co., New York.

**Wunderlin, George J.,** test engineer, Wright Aeronautical Corp., Paterson, N. J.

**Wynne, Gerald A.,** naval purchasing agent, British Purchasing Commission, 15 Broad St., New York.

**Zabriskie, A. Eugene,** tool designer, Mergenthaler Linotype Co., Brooklyn, N. Y.

### *Milwaukee Section*

**Aschauer, George Reisch,** engineering department, Twin Disc Clutch Co., Racine, Wis.

**Bostrom, Harold W.,** owner, Bostrom Mfg. Co., Milwaukee.

**Gibbons, A. G.,** vice-president and works manager, The Shaler Co. and National Rivet & Mfg. Co., Waupun, Wis.

**Pierson, John Edward,** engineer, Twin Disc Clutch Co, Racine, Wis

### *New England Section*

**Dye, Eldon L.,** regional engineer, Whitaker Battery Supply Co., Kansas City, Mo. Mail: 451 Park Drive, Boston, Mass.

**Heldack, John Martin,** supercharger, engineering department, General Electric Co., Lynn, Mass.

**Herscovitz, Harold,** fleet superintendent, Boston & Taunton Transportation Co., South Boston, Mass.

**Orlowski, Joseph,** installation engineer, Atlas Imperial Diesel Engine Corp., New Bedford, Mass.

**Vickery, Bruce T.,** test engineer, Pratt & Whitney Aircraft Division, United Aircraft Corp., East Hartford, Conn. Mail: 525 S. Main St., Mansfield, Mass.

### *Northern California Section*

**Fisk, Edwin M.,** chief engineer, Fisk Airplane & Engine Co., Mission San Jose, Calif.

### *Northwest Section*

**Bryant, Paul Murray,** draftsman, Boeing Aircraft Co., Seattle, Wash.

### *Philadelphia Section*

**Albert, Watson N.,** superintendent, motor equipment, Philadelphia Toilet & Laundry Co., Inc., Philadelphia.

**Cooper, Laurence,** special designing engineer, The Autocar Co., Ardmore, Pa.

**Muller, George J,** tool designer and engineer, Taylor Fibre Co., Betzwood, Pa.

**Schneller, Raymond John,** motor officer, Seventieth U. S. Engineers, Fort duPont, Delaware.

### St. Louis Section

**Adolphson, Roy T.,** engineer, Sunnen Products Co., St. Louis.

**Rhoads, Waldon Rice,** layout draftsman, Curtiss-Wright Corp., Robertson, Mo.

### Southern California Section

**Ager, Harold Weiler, Jr.,** automotive engineer, Richfield Oil Corp., Los Angeles.

**Anderson, Joseph C.,** sales engineer, Wright Aero Ltd., Los Angeles.

**Grady, Edward C.,** salesman, special accounts, Standard Oil Co. of Calif., Los Angeles.

**Hawley, Edwin R.,** engineering student, Ryan School of Aeronautics, San Diego, Calif.

**Hsiung, David N.,** P. O. Station D-1561, Los Angeles.

**Levy, Charles N.,** stress analyst, Timm Aircraft Co., Van Nuys, Calif.

**MacKillop, Angus Donald,** draftsman, Lockheed Aircraft Corp., Burbank, Calif.

**Meagher, William Ellery,** head sales engineer, Standard Oil Co. of Calif., Los Angeles.

**Nylund, John Homer,** engineer, Lockheed Aircraft Corp., Burbank, Calif.

**Starkey, Charles W.,** chemical engineer, General Petroleum Corp. of Calif., Los Angeles.

**Wood, Homer Jesse,** project engineer, Menasco Mfg. Co., Burbank, Calif.

### Southern New England Section

**Andreini, Geno J.,** experimental test engineer, Pratt & Whitney Aircraft Division, United Aircraft Corp., East Hartford, Conn.

**Baldwin, James P.,** general superintendent, The Corbin Screw Corp., New Britain, Conn.

**Burroughs, Richard Hansford, Jr.,** aerodynamics and flight test engineering, Vought-Sikorsky Aircraft Division, United Aircraft Corp., Stratford, Conn.

**Glad, Nicholas C.,** designer, engineer, Vought-Sikorsky Aircraft Division, United Aircraft Corp., Stratford, Conn.

**Green, Arthur W. F.,** materials engineer, Pratt & Whitney Aircraft Division, United Aircraft Corp., East Hartford, Conn.

**Hunsaker, James Peter,** engineering draftsman, Pratt & Whtiney Aircraft Division, United Aircraft Corp., East Hartford, Conn.

**McCarroll, William, Jr.,** production engineering office, Pratt & Whitney Aircraft Division, United Aircraft Corp., East Hartford, Conn.

**Mercier, Alonzo P.,** Captain, 74 Edgewood St., Hartford, Conn.

**Rosengarten, Nathan Robert,** junior designer, Pratt & Whitney Division, United Aircraft Corp., East Hartford, Conn.

### Washington Section

**Coxe, Keith E.,** junior mechanical engineer, National Advisory Committee for Aeronautics, Langley Field, Va.

**Kottas, Harry,** assistant engineer, National Advisory Committee for Aeronautics, Langley Field, Va.

**Manganiello, Eugene J.,** assistant mechanical engineer, National Advisory Committee for Aeronautics, Langley Field, Va.

**Voglewede, Thomas J.,** junior aeronautical engineer, National Advisory Committee for Aeronautics, Langley Field, Va.

**Wechsler, Laskar,** junior mechanical engineer, U. S. Navy Department, Bureau of Ships, Washington, D. C.

### Outside of Section Territory

**Adams, Lee Francis,** assistant to vice-president and manager of Standards Department, General Electric Co., Schenectady, N. Y.

**Adamson, Harry,** Lieutenant Colonel, U. S. Army, Fort Crook, Nebraska.

**Behney, Edward J.,** experimental engineer, Aviation Mfg. Corp., Williamsport, Pa.

**Hull, Dale O.,** automotive engineer, Standard Oil Co. (Ind.), Mason City, Iowa.

**Knott, Kenneth E.,** factory engineer, Kawneer Co., Niles, Mich.

**Leeper, W. T.,** vice-president in charge of sales, Bayou State Oil Corp., Shreveport, La.

**Lessing, Otto,** technical service manager, West India Oil Co., S. A., Panama R. P., Ancon, Canal Zone.

**McKenna, J. Roderick,** tune-up engineer, Ethyl Gasoline Corp., Atlanta, Ga.

**Patras, Floyd,** manager of maintenance, Southwestern Greyhound Lines, Inc., Fort Worth, Texas.

**Reger, Chris C.,** Captain, Quartermaster Corps Reserve, Fort Bliss, Texas.

**Ripley, Michael E.,** staff sergeant, Q.M.C. (Motors) U. S. Army, Fort Armstrong, T. H.

**Sheard, Harry J.,** refinery manager, Bayou State Oil Corp., Shreveport, La.

**Stevenson, Ross J.,** instructor, Air Corps Technical School, Chanute Field, Ill.

**Taylor, Charles E.,** engineer and general manager, Taylor Sales Engineering Co., Elkhart, Ind.

## About SAE Members

(*Concluded from page 23*)

**DAVID BEECROFT,** Bendix Products Division, Bendix Aviation Corp., has been elected first vice president of the Automobile Old Timers.

Among SAE members presenting papers at the 21st annual meeting of the American Petroleum Institute in Chicago in November, were: **H. C. MOUGEY,** technical director, General Motors Corp.; **T. A. BOYD** and **W. G. LOVELL,** heads of fuel and organic chemistry departments, respectively, GM Research Laboratories; and **J. F. WINCHESTER,** Standard Oil Co. of N. J.

The Engineering Foundation Welding Research Committee has organized a program to study the spotwelding of magnesium and aluminum alloys at the Rensselaer Polytechnic Institute, according to an announcement by **COL. G. F. JENKS,** chairman of the committee's industrial research division. The work is financed by the Army Air Corps, Wright Field, Bureau of Aeronautics, U. S. Navy, National Advisory Committee for Aeronautics, and the Aluminum Co. of America.

The Aeronautical Mfg. Corp., of which **ALBERT M. PATTERSON** is president, has announced the removal of its offices and factory from Buffalo to Niagara Falls, New York.

**JOHN W. OEHRLI,** Lycoming Division, Aviation Mfg. Corp., Williamsport, Pa., has been advanced from design engineer to project engineer.

**JACK REDINGER** is employed in the tool designing department at Boeing Aircraft Co., Seattle. He was formerly a student at the Polytechnic College of Engineering, Oakland, Calif.

## Obituaries

### *Ralph E. Northway*

Ralph E. Northway, who had been a member of the Society since 1908, died early last month after an illness of ten weeks' duration. He was 71 years of age and a resident of Saco, Maine.

When he became a member of the SAE in 1908, Mr. Northway was affiliated with the Northway Motor & Mfg. Co., Detroit, which produced motors and parts for passenger cars and trucks until its purchase by General Motors in 1909. Mr. Northway later was chief engineer of the Ohio Motor Car Co.; president and general manager of the Crescent Motor Co.; president of Northway Motors Corp.; chief engineer, Amalgamated Motor Corp., and works manager, Maxim Motor Co. For the past seven years Mr. Northway had been employed as research and mechanical engineer at the plant of the Saco-Lowell Co., Saco, Maine, manufacturers of textile machinery.

Mr. Northway took high school courses at the Mechanics Institute of Cincinnati, and later augmented his education by attending night schools and studying correspondence courses in mechanical and electrical engineering. He served his apprenticeship as a machinist at the Phoenix Iron Works, Ashtabula, Ohio.

### *Carl W. Weiss*

Carl W. Weiss, president and chief engineer of the Weiss Engineering Corp., Brooklyn, N. Y., died Sept. 14, 1940. He had been a member of the Society since 1930.

Born in Germany and educated at Erbach College, Erbach-on-Rhine, Mr. Weiss came to this country and became a citizen of the United States on his father's papers.

He was, perhaps, best known in the automobile industry for the design and development of 2-cycle gas engines and of the universal joint which bears his name. It was said that the Ruxton front-drive automobile was designed around that universal joint.

At the time he became a member of the Society, Mr. Weiss wrote that he had designed, built, and sold over 225,000 hp of 2-cycle oil engines ranging from 2 to 400 hp and many gas and caloric engines; that his generators had "furnished electric light for the famous palace of the king of Siam and many others of lesser wealth in all parts of the world." He also noted that he had built thousands of cash registers which he designed and patented, and that he later sold his patents to the National Cash Register Co. These are but a few of the products which he designed and developed.

### *Frank B. Hamerly*

Frank B. Hamerly, a vice president of the Independent Pneumatic Tool Co., Aurora, Ill., died suddenly Nov. 27, while in California. Mr. Hamerly was 53 years of age and had been a member of the Society since 1931.

When he joined the Independent Pneumatic Tool Co., in 1912, Mr. Hamerly took the post of superintendent of tools. Two years later he was named works manager and in 1930 was advanced to the vice presidency.

# Safety Angle of Driver Selection and Maintenance Topic of Meeting With ATA

■ **So. California**

SELECTION of safe drivers, driver supervision for safety, and mechanical conditions affecting safety, were topics attracting more than 250 men to the joint dinner meeting of the Society's Southern California Section and the Safety and Operations Section of the American Trucking Associations, held Nov. 12 during the ATA convention in Los Angeles.

Findings of men carrying on research in the field of psycho-technical examination and selection of drivers, were reported by Prof. Frank C. Davis of the University of California at Los Angeles.

Supplementing Prof. Davis' remarks was a paper by William Cleves, Yellow Cab Co. of Calif. Conclusions drawn from various physical, mental, and psychological tests made by his company in selecting drivers, he said, correlate closely with the opinions of the professional research men, as outlined by Prof. Davis.

However, Mr. Cleves added, "None of these tests have proven helpful in telling us, other than within very broad limits, whether or not a man may be accident prone after he is once hired. . . . Tests are mere snapshots, showing the man's condition at a given moment, a moment when he is putting his best foot forward."

"Tests," he pointed out, "will not reveal the sinking spells or momentary lapses of consciousness associated with the petit mal of epilepsy – close observation will. Tests will not reveal tendencies toward speed and recklessness – observation will. Tests will not reveal inattention of the man worrying over self or home conditions – observation will. Tests will not reveal habitual or occasional drinking – observation will. Tests will not reveal poor judgment – observation will; and good judgment in driving is far more important than good health. A test would not reveal the poor judgment of a driver trying to beat the light or failing to slow for abrupt curves."

These comments, he said, do not mean that his company does not believe in tests. "On the contrary," he declared, "we believe that any man who drives an automotive vehicle in traffic should be physically sound in every respect, and that every man you employ should undergo a thorough physical examination which will insure you against employing men suffering from physical or visual impairment."

In summary, Mr. Cleves, from the standpoint of reducing accident frequency, recommended:

1. Selection of physically sound men between the ages of 30 and 50, who have the requisite ability to handle the type of equipment operated;

2. Careful supervision and observation of the man's operating and personal habits, corrected when necessary by

3. Discipline – administered fairly and justly.

He also suggested analysis of accidents, recheck physical examinations when indicated, friendly interest in a man's personal affairs to the point of aiding in the elimination of worry, and arrangement of work shifts so that no driver will be continued on duty beyond his threshold of fatigue.

### Maintenance for Safety

The thoughts of the audience were shifted to maintenance practices for the promotion of safety by J. L. S. Snead, Jr., maintenance engineer, Consolidated Freightways. Besides urging normal careful attention to brakes, tires, steering, lights, and accessories that have direct bearing on the accident proneness of a vehicle, Mr. Snead gave operators some hints on how to improve the safety of vehicles as they come from the manufacturer.

He suggested, for instance, the protection of drain cocks in air-brake system from breakage by flying rocks, and the placing of drain cocks so that they will be easily available; this to insure drainage to guard against freezing in cold weather.

"In the West," he said, "we feel that front-wheel brakes are actually unsafe during the winter on the truck and trailer combinations which we use. We feel that requirements should permit us to dispense with them so long as the other five axles have adequate brakes to control the combination."

In diesel motors which have considerable soot and sludge in the crankcase, he said, "we have found that the use of a self-lubricated compressor is more satisfactory and that it eliminates many troubles which result from oil and carbon in the braking system."

Hand brakes were condemned by Mr. Snead as having little value, except for parking. There is a real need, he declared, for a hand brake which will actually stop a 68,000-lb combination from 40 mph in a reasonable distance without setting fire to the equipment. This is a big problem, he added, because too large a brake drum on the drive shaft may break the shaft itself, and there is a tremendous amount of heat to dissipate when stopping 68,000 lb.

These are but a few of the suggestions made by Mr. Snead, who concluded his paper with the remark: "I do not believe that we should accept designs which we know increase the possibilities of accidents, without making some endeavor to bring about a gradual improvement in these designs."

In discussion of Mr. Snead's paper, L. L. Beardslee, superintendent of shops and garages, Los Angeles County, censured final inspections made by car and truck manufacturers. "We have found," he said, "that it is necessary to expend from 7 to 10 hr labor upon the new vehicles we receive, on the correction of factory assembly-line oversights, before the vehicles can be safely and economically put in use. These defects include improperly adjusted headlights, loose connections, dry wheel bearings, transmissions and differentials, loose axle nuts, disconnected shock-absorber links, loose steering gear linkage, improper axle settings, poorly adjusted brakes, and hundreds of loose nuts and screws."

Mr. Beardslee emphasized the importance of proper inspection of vital parts subject to fatigue. "You might argue," he said, "that fatigue failures are rare in a properly engineered vehicle. However, the vehicle is often called upon to carry loads far in excess of that for which it was designed, and the operator who believes that profits can be increased by overloading and overspeeding is bound to awake sadder but wiser."

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*Remarks by T. V. Rodgers, president of the American Trucking Association, urging continued cooperation between the ATA and the SAE on common problems, opened the meeting. Ellis W. Templin, past chairman of the Section, responded, and introduced Section Vice Chairman Mac Short, who presided at a short business meeting in the absence of Chairman Ulric B. Bray, who was presenting a paper at the Society's National Fuels & Lubricants Meeting in Tulsa.*

*Participating in the non-technical phase of the program were: Charles G. Morgan, Jr., manager, ATA Operations Division; F. C. Horner, advisor on transportation to the National Defense Advisory Commission, and Stuart Russel, executive vice president of the Motor Truck Association of Southern California.*

*The speakers were introduced by technical chairman Rex Taylor, Southern California Section vice chairman for transportation and maintenance.*

## Number of SAE Steel Compositions Reduced

The number of SAE steel compositions have been reduced approximately 25% by the Iron & Steel Division of the SAE Standards Committee, in its periodic review of the compositions to bring them up to date with general practice. Changes were made in a few compositions in this respect. The reduction in number is a major move by the Division in the direction of promoting more economical steel manufacture and use.

For the first time, the steel compositions have been classified as "primary" or "secondary," according to usage. The purpose of this classification is to encourage a maximum reduction of compositions in use, by the substitution of primary steels for secondary steels where practical. The classifications were based upon the Division's careful study of usage in automotive, machine-tool, electrical-machinery, railroad, and miscellaneous machinery industries.

The results of the survey and action taken by the Division have checked closely with findings of the American Iron & Steel Institute in a survey made toward developing a manual of so-called "significant" steels on the basis of tonnage production.

## Engine Makers Keep Pace With Fuel Developments

**▪ Oregon**

"Engine designers have been quick to take advantage of each advancement in fuel manufacture; designing engines to run on today's fuel, yet mindful of tomorrow's," William H. Hubner, Ethyl Gasoline Corp., declared in presenting the paper, "Fuel Factors in Future Engine Design," before the Oregon Section, Nov. 22. The antiknock quality has been improved in the last ten years in the third, regular and premium grades of fuel, he commented, adding that during this period designers took advantage of this achievement by boosting compression ratios about 26%.

"The oil industry already has demonstrated its ability to provide higher octane fuels," he declared. "Aviation fuels of 95 to 100 octane numbers are now being produced commercially in quantities four to five times the needs of the military services, airlines, and private fliers. Some of this is finding its way into premium grade fuels. Although today's automotive engines do not require fuels of such high octane number, their demands have risen steadily.

"The average octane rating of regular grade gasoline has increased approximately 15 points during the last 10 years, reaching 74 ASTM (Motor) method early this year, according to a survey made by the Ethyl Gasoline Corp. This octane rise has not been uniform and has resulted from increased octane competition among refiners, occasioned by changes in laboratory knocking methods, by the use of tetraethyl lead in regular grade gasoline, by the development of new and improved methods of refining, and by steadily rising compression ratios and octane requirements.

"By 1945," Mr. Hubner predicted, "we'll see premium road octane values of about 95 and about 80 in the other grades."

What course will engine design take to attain this end? Mr. Hubner said he believes much could be accomplished through the use of superchargers, since, by supercharging alone a tremendous increase in horsepower with relative fuel use could be obtained. However, he added, there are many problems which must be solved by the refineries before 80- to 90-octane gasoline can be made economically.

"We have to think of catalytic cracking which gives a higher octane value than thermal cracking," he said. "In 1930, about 10% of the total gasoline produced was natural and in 1940 that type amounted to only 7%; straight-run gasolines amounted to 50% of the total in 1930 and 33% in 1940; thermally cracked and refined gasolines were set at 38% in 1930 and 53% in 1940. In 1930, there was practically no catalytically cracked gasoline as against 4% in 1940. Likewise, there was no polymer gasoline or alkylate or iso-octane in 1930, but in 1940 polymer gasoline amounted to 2% of the total and the other to 1%."

Mr. Hubner said that, in addition to getting higher octane gasolines through refining, increased operating values could be obtained through sulfur removal.

"By removing the sulfur we can improve the lead susceptibility, thus improving the octane rating," he explained. "Certain processes allow the removal of organic sulfur compounds (mercaptans, monosulfides, disulfides, polysulfides), but we are unable to remove thiophenes. Sulfur content is of less importance from a corrosive standpoint, but is of considerable importance as to the lead susceptibility."

Mr. Hubner concluded his paper with the pledge: "Whatever are the demands in the future, the oil industry stands ready to fulfill them."

Harry Kuhe, division manager for Ethyl at Seattle, and R. R. Mead, field representative at Portland, accompanied Mr. Hubner and assisted him in answering questions during the technical discussion.

## Cumming Sees Diesel Buses Here to Stay

**▪ Metropolitan**

"Diesel engines in bus transportation are here to stay," William J. Cumming, general superintendent, Surface Transportation Corp., New York, declared at the Metropolitan Section's Dec. 5 meeting, backing his assertion with an impressive report of economy in operation shown by his company's fleet of 175 diesel-powered buses. Mr. Cumming was introduced by Section Vice-Chairman Albert J. Blackwood.

During 1933, Mr. Cumming stated, when numerous economic repercussions were cutting deeply into urban transportation receipts, and when his company faced obsolescence of equipment on one hand, and uncertainty of franchise renewals on the other, the system undertook a serious study of the operating economies claimed for diesel-powered buses. It appeared, he said, that if 30% saving in fuel could be achieved, compression-ignition engines might be the answer in view of the average annual expenditure of about $160,000 for the 3,000,000 gal of gasoline consumed by the company's fleet.

In 1936 three of the company's buses were converted to diesel power, and during the next three years the total number of diesel-powered buses in the fleet reached 175. This period, he said, brought to light certain problems in operation and maintenance, but these were solved and in no way affected the original conviction that for mass transportation the diesel holds advantages over the gasoline engine. Fuel consumption was reduced as much as 60% in some months, he said.

Recounting these problems and their solutions, Mr. Cumming emphasized the need for care in selecting lubricants, the advisability of keeping oil temperatures somewhat constant by means of an oil radiator, and of keeping lubricants and fuels clean by use of filters.

### Diesel First Cost Greater

Turning to the economic phase of the diesel engine in bus transportation, Mr. Cumming commented that the first cost of a 40-passenger diesel-electric bus is about 20% greater than a comparable gasoline gear-transmission vehicle, and 10% greater than fluid-drive or fluid flywheel vehicles. Diesel buses operating over the Surface Transportation system, he revealed, are averaging one and one-third more miles per gallon of fuel than a similar type of gasoline vehicle, while the average price of fuel, including all taxes, was 20% less than gasoline for the year ending June 30, 1940. His company feels, he said, that because of the electric or fluid drive the life of diesel buses may be extended beyond that of gasoline buses, thus extending amortization over a greater period.

Ralston B. Smyth, superintendent of rolling stock of the Boston Elevated Railway Co., reported in discussion that he found maintenance problems in general similar in the case of diesel and gasoline buses, but pointed out that his company had to specify numerous design changes in the early stages of their diesel operations, begun in 1936 with one diesel bus.

However, because of the nature of the runs made by diesel buses, and because of the differences in ages of the various makes of diesel and gasoline units operated, no cogent comparison could be made between equipment of the two types, he said.

A moving picture of the exhaust of diesel buses was shown, indicating that this feature was not particularly serious. Changes in injection timing, Mr. Smyth said, eliminated much of the earlier troubles of excessive smoking.

Charles O. Guernsey, a visitor from the Philadelphia Section, remarked that he had seen "less heat and more light" during the meeting than he had ever experienced at a diesel meeting.

Prof. L. C. Lichty of Yale University, SAE vice president-elect representing the Diesel-Engine Activity of the Society, stressed the need of continued study of diesel operation as an aid to engine designers.

Section Chairman Rudolph Gagg pointed out the need for thoroughgoing operation research as a means of aiding diesel design-

### Field Editors

***Baltimore*** – J. F. Rowley
***Buffalo*** – Harry L. Chisholm, Jr.
***Canadian*** – Warren B. Hastings
***Chicago*** – Austin W. Stromberg
***Cleveland*** – R. S. Huxtable
***Dayton*** – C. S. McCann
***Detroit*** – W. F. Sherman
***Indiana*** – Harlow Hyde
***Kansas City*** – Howard F. Dougherty
***Metropolitan*** – Leslie Peat
***Milwaukee*** – H. I. Hazzard
***New England*** – James T. Sullivan
***No. California*** – Trescott S. White
***Northwest*** – R. J. Hutchinson
***Oregon*** – J. O. Brice
***Philadelphia*** – H. E. Blank, Jr.
***Pittsburgh*** – Murray Fahnestock
***St. Louis*** – J. A. Beard, Jr.
***So. California*** – Major W. A. F. Millinger
***So. New England*** – L. Morgan Porter
***Syracuse*** – No Appointment
***Tulsa Group*** – W. F. Lowe
***Washington*** – L. C. Smith

ers in improving their product on through the years.

Austin M. Wolf, national membership chairman of the Society, urged redoubled effort on the part of the whole membership to introduce to their associates the benefits of SAE membership.

## Armored Force Topic of National Defense Meeting

▪ *Washington*

"National Defense" was the topic of a triumvirate of speakers at the Washington Section's meeting, Dec. 10, attended by a record turnout of representatives of government and industry. SAE President Arthur Nutt and General Manager John A. C. Warner were guests of honor, sharing the program with Lt.-Col. Stephen G. Henry, commandant, the Armored Force School, Fort Knox, Ky.

"We have witnessed one of the greatest military phenomena of all times," Col. Henry declared, referring to the swift successes of the German Army in Holland, Belgium, and France. He credited these successes to the powerful shock of heavy mechanized divisions, close coordination and cooperation of dive bombers, and the support of well-trained infantry.

The Armored Force, created July 10, 1940, by a War Department directive, is the completion of a plan conceived at the end of World War I, Col. Henry stated. At the present time, he said, the combat elements of the Armored Force consists of the 1st Armored Corps, containing the 1st and 2nd Armored Divisions located at Fort Knox, Ky., and Fort Benning, Ga., respectively, and the 70th Tank Battalion, GHQ Reserve, stationed at Fort Meade, Md. As our production of equipment increases, he added, the establishment of new armored divisions and GHQ reserve battalions will take place.

Col. Henry commented that self-sustaining armored units must have a reconnaissance echelon, a striking echelon, a support echelon, and a service echelon. The similar organization of the German Panzer Divisions proves the soundness of this plan, he said. The vehicular strength of an armored division, omitting motorcycles, totals 2494 vehicles of all types, including tanks, he revealed.

The tactics of an armored division stress speed and maneuver, combined with bold aggressive action, he explained. Its primary role, he added, is in offensive operations against vital objectives in the rear of hostile main battle positions. He also noted that successful operation on a large scale is contingent upon control of the air. It is particularly important, he said, that the armored division work intimately and constantly with observation and combat aviation.

The armored division, Col. Henry declared, is the fastest, hardest hitting, ground combat unit in the U. S. Army today.

French aircraft production difficulties were related by Mr. Nutt, who was in France shortly before the collapse of the country. He pointed to lack of cooperation between government and industry as a prime cause of French production difficulties. The government did not encourage plant expansion with financial aid, he said, adding that it limited profits to 4% and enforced contract penalties right up to the end, even against plants whose production had been disrupted by bombings.

Continuing his talk, Mr. Nutt reviewed many of the points stressed in earlier talks before other SAE Sections.

The activities of the Society in behalf of national defense were detailed by Mr. Warner, who spoke of SAE cooperation with the military branches of the government.

## Washington Snapshots

**Above: George E. Reynolds, left, chairman of the Washington Section, receives an SAE emblem from B. H. Benson**

**Below: Lt.-Col. Stephen G. Henry, commandant, the Armored Force School, tells the part of the Armored Force in national defense**

## Praises SAE for Part in Developing War Vehicles

▪ *New England*

The United States is basically better prepared for modern warfare of movement than any other nation in the world, Col. Benjamin F. Miller, chief of staff, First Corps Area, U. S. Army, told members of the New England Section, Dec. 3. Military success, he declared, is based upon training, equipment, and morale. Our military program will take care of training, he added, crediting the SAE and its members with important contributions to the production of the best transportation for war movement. Our morale, he emphasized, is vastly superior to that of some other nations.

Traction is the keynote of mechanized transportation from the government point of view, he said, pointing out that when makers of trucks were able to satisfy the Army that their vehicles could go any place a mule could, mechanized military land transportation received government consideration.

Touching on the possibility of invasion, Col. Miller opined that it would most likely come along the St. Lawrence and Lake Champlain valleys. It would be almost impossible for the United States to carry on military operations, he declared, should a hostile power occupy that part of the nation which lies northeast of a line between Delaware Water Gap and the western exit of the Erie Canal. He added that the geographical location of New England makes it a natural gateway for invasion and that it would be a primary objective of an invading power because of the concentration of manufacturing industries upon which the nation depends.

Col. Miller began studying motor transport 30 years ago when a lieutenant in the 27th infantry, and wrote special articles for automotive magazines as early as 1912. At the meeting he showed slides comparing early mechanized equipment with that of the present day. These he followed with motion pictures of modern motorized military equipment fording streams, crossing ditches, and climbing steep grades while engaged in maneuvers.

## 'Jeep' Makes Good In Military Service

▪ *Milwaukee*

Back in 1936 when the Minneapolis Moline Power Implement Co. was making preliminary tests on the "Jeep" or high-speed wheeled tractor, someone remarked that it would go any place that an Army mule could go. During Army maneuvers last summer the "Jeep" was equipped with machine gun and trailer for carrying men, and used as a combination scout and combat car.

That, in brief, was the military history of the "Jeep" as traced by Minneapolis Moline's chief engineer for tractors and engineering, A. W. Lavers, in a talk before the Milwaukee Section, Nov. 15. It originally had been developed as a modern creation to be equipped with electric starter, cigar lighter, radio, and heater, with a modern truck cab available as optional equipment, he said.

During the last war, he recalled, the Minneapolis Moline company built a shell component and, when the fracas was over, found itself practically out of business. This time the company decided to take advantage of its "mechanical mule," and try to make it its contribution to national defense, he said. Unofficial Army tests in 1937 were followed by official tests in 1938 and 1939, and later by government orders. It was pointed out that the special features of the tractor, which make it adaptable to agricultural, industrial, and military use, were considered early enough in the development program so that the entire design is coordinated, and the change-over from one type to another can be made with a minimum of difficulty. In case of a national emergency, Mr. Lavers noted production of the tractor for military use could be moved up to 35 or 40 units per day.

The front-wheel drive of the tractor was mentioned by Mr. Lavers as an outstanding feature. It can be thrown in or out at the option of the driver, he explained, adding that there is no differential between the front and rear axles and that synchronization would not be good at high speeds.

Therefore, he said, high-speed work is usually done with only the rear axle driving.

Mr. Lavers also spoke of the roller bumper, which facilitates rough-country going; a horizontal plate which protects the engine and driving mechanisms while negotiating a rough terrain; and gave mechanical and dimensional specifications of the tractor.

After explaining that the "Jeep" has a speed range from 2.7 to 40 mph, that it will haul a 6-ton gun up a 35% grade in second gear, and that it will operate in 40 in. of water without being drowned out, Mr. Lavers had shown a number of slides showing sectional drawings and close-up photographs of the tractor, as well as views of its performance in company and army tests.

## Predicts More and Cheaper Light Commercial Planes

▪ *Kansas City*

R. W. Rummel's paper, "Maintenance Development in Light Aircraft," combined with the Ethyl Gasoline Corp. moving picture on car maintenance, "An Ounce of Prevention," provided technical fare for the Kansas City Section's first meeting of the year, Nov. 18.

Pointing out that the growing number of light commercial aircraft in daily use is rapidly leading to a demand for their manufacture on a production basis, Mr. Rummel, who is chief engineer of Rearwin Aircraft & Engines, Inc., predicted lower initial cost of these planes. Now is the time, he said, for manufacturers to prepare for future increases in service requirements, and to begin to assist owners and maintenance agencies in obtaining proper tools, helpful literature, and other facilities. His paper was substantially the same as the one he presented at the Society's National Fuels & Lubricants Meeting at Tulsa, Nov. 7-8, reported on page 16 of the December SAE Journal.

Mr. Rummel was introduced to the 65 members and guests by Section Chairman Ralph Matthews. Many of the guests were students from aviation schools in the Kansas City area.

## Sees Magnesium Output 25,000,000 lb in 1941

▪ *Indiana*

"Magnesium, the oldest of the newer metals and the lightest commercial metal, antedates aluminum, and yet, until recent years, it has been a backward child," said W. G. Harvey, sales manager, American Magnesium Co., in his talk before 200 members and guests of the Indiana Section, Dec. 13. For more than a decade, he added, use and production of magnesium lagged – we did not know how to put it to general practical use. Now, he declared, it is expanding at a rate faster, perhaps, than any other mechanical unit in the world. Six million pounds were produced in 1927, as compared to an estimated 25,000,000 lb in 1941.

Magnesium as we first knew it, he explained, was unstable due to impurities. When pure magnesium was obtained, we learned to combine it with aluminum, zinc, and at times, manganese, to obtain a number of alloys that could be used for sand, permanent-mold, and die castings, he stated. Magnesium also is extruded, rolled, hammered, and pressed, he said.

He spoke of the extensive and rapidly expanding use of magnesium in aircraft and aircraft-engine parts, and landing wheels. It likewise is making great strides in the portable-machine field, for household appliances, typewriter parts, and textile machinery, he noted.

One case cited by Mr. Harvey was that of substituting sand-cast magnesium core boxes for those of aluminum. They are much lighter, he said, greatly reducing the fatigue of the men using them. They increase manhour output, last longer, and. in the end, cost less, although the original cost is greater, he added.

Two moving pictures tracing aluminum from the mine to the finished product were shown after Mr. Harvey's talk.

## Record-Breaking Crowd Welcomes SAE Officers

▪ *Canadian*

SAE President Arthur Nutt, President-Elect A. T. Colwell, and General Manager John A. C. Warner were honored Nov. 19 by some 350 members and guests of the Canadian Section at the Royal York Hotel, Toronto. Attendance set a new record. Officers of the Royal Air Force, the Royal Canadian Air Force, and key men in Canada's war industries and engineering societies were among those hearing Mr. Nutt in an off-the-record report of his observations in France during the stirring days before its fall.

It was the opinion of every competent commentator with whom he talked, Mr. Nutt stated, that Britain had done considerably more than it had undertaken to do in the battle of France, and that Britain's war effort had been beyond praise. Introduced by SAE Councilor W. E. McGraw, a former chairman of the Section, Mr. Nutt recounted many of the observations that he had reported in talks before American Sections of the Society, reported in earlier issues of the SAE Journal.

A toast proposed to "Our American Guests" by Section Chairman Norman H. Daniel, was responded to by Mr. Colwell.

The Society's undertakings in the furtherance of the national defense program in the United States was reviewed by Mr. Warner, who also spoke of the many Canadian members engaged in the Dominion's war effort. Mr. Warner was introduced by Section Secretary Warren B. Hastings, who presented Messrs. Nutt and Warner with mementos of their visit to the Canadian Section.

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*R. C. Berkinshaw, President of the Toronto Board of Trade, tendered a luncheon to Messrs. Nutt, Colwell, and Warner on the day of the meeting. Other guests were members of the Section's Governing Board. The host of the dinner meeting was George Stauffer, Thompson Products, Ltd.*

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*When Mr. Nutt addressed the SAE Student Branch at the University of Wisconsin, Dec. 2, some 300 student members and guests were on hand to welcome him, despite the fact that the thermometer was registering just above zero and many students had to walk three-quarters of a mile to reach the auditorium.*

*In the evening Mr. Nutt addressed the Madison Technical Club.*

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*Speaking before the Dayton Section, Nov. 26, SAE President Arthur Nutt augmented his talk on "Lessons Learned from European Aircraft Industry" with a description of the Society's national defense program. He spoke particularly of SAE cooperation with the Ordnance and Quartermaster Corps of the Army and with the aviation branches of both the Army and the Navy.*

## SAE Coming Events

**Jan. 6 – 10,**
**Annual Meeting**
**(and Engineering Display)**
**Book-Cadillac Hotel – Detroit**
(*See pages 16 and 17 for program*)

**Baltimore – Jan. 16**

Engineers Club; dinner 6:30 p.m. Diesel Fuel Injection – Carroll R. Alden, research engineer, Ex-Cell-O Corp.

**Chicago – No meeting**

**Cleveland – Jan. 13**

Cleveland Club; dinner 6:30 p.m. Welded Steel Structures – Everett Chapman, president, Lukenweld, Inc.

**Dayton – Jan. 6**

Research in National Defense – Brig.-Gen. Echols.

**Indiana – No meeting**

**Metropolitan – Jan. 16**

Hotel New Yorker, New York City; dinner 6:30 p.m. A. T. Colwell, vice president, Thompson Products, Inc., and president, SAE.

**Philadelphia – Jan. 8**

Penn Athletic Club; dinner 6:30 p.m. Subject – Aviation.

**Pittsburgh – Jan. 28**

Webster Hall; dinner 6:30 p.m. Meeting at Mellon Institute. Speaker: Robert Cass, White Motor Co.

**Northern California – Jan. 14**

Hotel Leamington, Oakland; dinner 6:30 p.m. Subject – Fleet Operation.

**St. Louis – Jan. 28**

Trip to Chevrolet and Fisher Body Plants.

**Southern California – Jan. 17**

Elks Club, Los Angeles; dinner 6:30 p.m. Subject – Passenger-Car Engineering.

**Southern New England – Jan. 8**

Hotel Bond, Hartford; dinner 6:30 p.m. Technical Aspects of Exhaust Silencing – Roland B. Bourne, research engineer, Maxim Silencer Co.

**Syracuse – No meeting**

**Washington – Jan. 14**

Dodge Hotel; dinner 6:30 p.m. Carburetors for Modern Aircraft Engines – M. J. Kittler, chief engineer, Holley Carburetor Co.

## Superfinish Development Traced by D. A. Wallace

**▪ Washington**

"The wearing surfaces of brake drums for Chrysler cars are finished by the Superfinish process in 15 sec," D. A. Wallace, president, Chrysler Division, Chrysler Corp., told members of the Washington Section, Nov. 12. With a geometrically perfect surface, he explained, braking action is smooth, squeaks are eliminated, and adjustments due to initial wear are not necessary.

During the past six years, Mr. Wallace has directed Chrysler research on the development and application of fine metallic surface finish, from which has evolved Superfinish, "a revolutionary technique in the commercial preparation of smooth surfaces."

Back in 1934, he said, researches for finer finishes were begun as the result of "Brinelling" of axle bearings of cars being transported by rail to the Pacific Coast. "Brinelling" was a term applied by service men to indentation in the finished metallic surface of the outer cup of a tapered roller bearing while in a static condition, caused by the weight of the car. On the road, he stated, these defects caused an annoying buzzing noise.

The indentation, he explained, was very slight, measuring approximately 0.0001 in., and only went into the "fuzz" left on the surface of the race by the finish grinding operation, and the solid base metal was not impaired. This "fuzz," known as fragmented or smear metal, could be eliminated by lapping, Mr. Wallace said. In search of a more economical and rapid means of removal, he added, a simple reciprocating device was developed, using a bonded abrasive stone that was arranged to give a short reciprocating stroke under light pressure while the work was rotating. This device quickly removed the superfluous metal, he commented, leaving a satin-smooth, geometrically correct surface. None of the bearing cups so finished gave any indication of "Brinell" or failure, he reported. From this beginning, Mr. Wallace stated, a new method of obtaining perfect surface finish was developed under the name of "Superfinish."

Superfinish eliminates initial wear, increases the life of parts and load-capacity of bearings, Mr. Wallace stated, adding that it is now being used on many engine parts, including pistons, camshafts, crankshafts, and valve stems.

WELCOME BACK

For The S.A.E. Convention
January 6-10

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## Fleet Men Participate In Three-Paper Program

**▪ No. California**

Fleet men got the latest information on hydraulic couplings, hydraulic transmissions for diesel coaches, and developments in bearing materials at the Northern California Section's Nov. 12 meeting. The subjects were treated, respectively, by T. J. White, American Blower Corp.; James N. Mosher, Standard Oil Co. of Calif., and R. A. Watson, Federal Mogul Corp.

Although developed originally to connect two or more engines to a single propeller shaft, and later used as speed changers, the newest and most widespread application of hydraulic couplings is to smooth out a pulsating drive, Mr. White told his audience. The unit as installed on Chrysler cars, he said, is an example of this type of application. In diagraming and explaining the construction and operation of the unit, Mr. White stated that the normal slip is 2 to 3%. He also pointed out that the placement of internal baffles and the varying of the quantity of fluid in the coupling provide means for altering the stall point, or speed at which the coupling automatically unloads. He explained that ability to control the stall point is of considerable advantage in internal-combustion-engine applications, particularly in shovels and cranes, since by this means the engine can be prevented from stalling.

Next for discussion was the General Motors' hydraulic transmission for diesel coaches. Mr. Mosher explained the construction and use of the Yellow Bus unit by means of slides. In this unit, he said, a two-stage turbine operates as a torque converter for bus speeds up to 20 mph. At this point, under normal conditions, an automatic governor disengages the turbine and shifts the unit into direct drive, he explained. For sudden pick-ups, he added, the turbine can be kept engaged up to speeds of

45 mph before dropping into direct drive. As explained by Mr. Mosher, this transmission unit consists of a friction clutch, turbine, over-running clutch, reverse gearing, angle gearing, and direct-drive clutch.

Describing the unit as fully automatic, Mr. Mosher showed diagrams of the electric and pneumatic circuits which, by means of switches, solenoids, and air-cylinder units, do all the mechanical work in operating the bus. This includes shifting of clutches and momentary changes of engine speed to allow synchronizing of meshing parts.

### New Bearing Materials

Mr. Watson introduced his topic with a discussion of aluminum-tin alloy bearings which have been in experimental service for about a year. They offer promising possibilities, he said, as they are easy to manufacture and stand up well under service. The only requirement in using this type of bearing, he noted, is that the shaft must be of a hardness of 550 Brinell or more. Among other bearings discussed by Mr. Watson was a pure silver bearing, 0.01 in. thick, on a steel backing, plated with lead and then plated with indium. Such bearings, he said, while expensive and hard to make, are giving good service under severe aircraft-engine conditions.

Technical chairman of the meeting, William G. Thomson, Marin Dairymen's Milk Co., Ltd., presided over a lively discussion, which centered almost entirely on the hydraulic coupling. E. E. Richter, who handles truck applications of this type coupling, assisted Mr. White in answering questions.

Charles A. Winslow, Winslow Engineering Co., pointed out that the biggest advantage of fluid couplings is that they allow use of the most desirable point on the engine torque curve. He asked the efficiency of an automotive type coupling, and was told that 97 to 98% is normal, corresponding to a 2 to 3% slip. Mr. White further pointed out that a certain amount of slip is essential in order to maintain fluid circulation and transmission of power.

In answer to a question by Sidney B. Shaw, Pacific Gas & Electric Co., in regard to size of coupling for a given power transmitted, Mr. White said that the horsepower is proportional to the cube of engine rpm and the fifth power of the coupling diameter. This, he commented, indicates the advantage of using as high an engine speed as possible in order to reduce the size of coupling required. It also indicates the necessity of placing the coupling in the high-speed shaft of a geared system, he said.

Mr. Shaw asked also what per cent slip could be continuously experienced without external cooling of the coupling fluid. Ten per cent was given as a fair value, and it was suggested that if the speed of the vehicle dropped to where the slip was greater than this figure, the operator should shift to a lower gear.

In answer to a question by A. K. Brumbaugh, Knuckey Truck Co., Mr. Richter stated that a truck running down hill would have the use of engine compression, just the same as with a direct-connected transmission. This is possible due to the straight vane features of the coupling halves, giving equal performance in either direction, he explained.

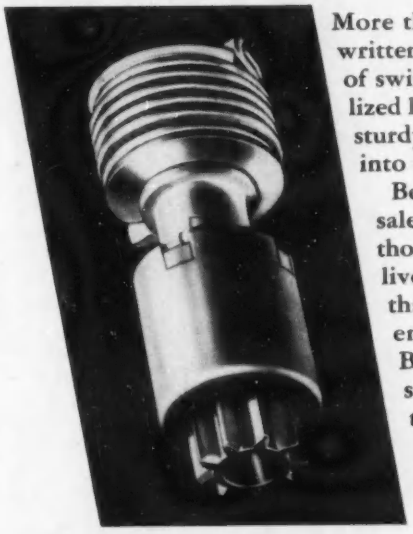
Peter Glade, Purity Stores, inquired whether an engine could be started by running down hill and engaging the clutch. This is possible, according to Mr. White and Mr. Richter.

Units of 17½ and 21 in. diameter are available at the present time for installation in trucks, said Mr. Richter in reply to a further question by Mr. Shaw. A 21-in. unit, complete with transmission and special adapter house, weighs approximately 520 lb he said. Mr. Glade pointed out that the extra weight of this unit represents reduction in payload capacity and must be considered in the cost of such a coupling.

In reply to Mr. Glade's question regarding possible benefits in fuel consumption, Mr. Richter and Mr. Shaw reported that on the basis of limited experience, an increase in fuel consumption of about 3% could be expected for city stop-and-go service, less for highway service. Offsetting this increase in fuel consumption (due to necessary slip in the coupling), maintenance and repair are greatly reduced, due to elimination of jerks and general smoothing out of engine drive, they contended.

Mr. Richter stated further that installations of hydraulic couplings are definitely beyond the experimental stage, but that with wide variation in applications, actual field results in any one class of service are incomplete at the present time. Adding to the discussion,

FOREVER
*starting something!*



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BENDIX DRIVE

Mr. Brumbaugh pointed out that many transmission ills are due to road conditions rather than jerky operation. An uneven road is a most serious operating condition and would not be materially improved by adoption of hydraulic couplings, he said.

Messrs. Richter, Glade and Brumbaugh, in discussing the economics of adopting fluid clutches for trucking operations, concluded that the advantages vary with the type of service – indispensable in some; in others desirable, but too expensive at the present time.

Seventy-two members and guests attended the pre-meeting dinner; total attendance passed the hundred mark.

## Gas Turbines Subject of Meeting with ASME Group

■ *Buffalo*

"Gas Turbines" was the topic up for discussion Nov. 19 as 150 members of the Buffalo Sections of the American Society of Mechanical Engineers and the SAE turned out for a joint meeting. The speaker was W. O. Lowell, research engineer, gas turbine department, Allis-Chalmers Mfg. Co.

Gas turbines built to date, Mr. Lowell explained, are used in oil fields for the generation of electric power up to 6000 kw. The fact that several of them have been operating almost constantly at full load since 1936, he declared, would indicate that these prime movers are a reality instead of a hypothetical pipe dream.

The unit, he explained, operates on a constant-pressure expansion cycle and is comprised of an axial-flow multi-stage reaction turbine direct connected to axial-flow multi-stage reaction compressor and geared to a generator to reduce the turbine's 4200 rpm to normal generator speeds; a constant-pressure combustion chamber and fuel spray nozzle; a heat exchanger, and a starting motor which brings the turbine up to about 25% operating speed in order to obtain combustion air in sufficient quantity to maintain combustion.

At full load, he stated, the compressor delivers air at 45 lb per sq in. gage and about 300 F to the combustion chamber into which the fuel oil is sprayed. Here, he said, the air and about 1% combustibles are heated to 1000 F. The hot gases enter the turbine at that temperature and exhaust at 600 F, with an overall thermal efficiency of 17 to 18%. By passing the exhaust gas through a heat exchanger and raising the compressed air to about 450 F, he continued, the overall thermal efficiency of a comparatively small unit can be raised to 24%, or better. One 6000-kw unit, he added, operates on an efficiency of 32%.

The use of 1000 F turbine temperature, he commented, has been made possible with a blade steel having 19% chromium and 10% nickel.

In concluding, Mr. Lowell stated that they expect before long to raise the combustion temperatures to 1200 F and to be able to match steam-turbine powerplant efficiencies.

## Masi Reviews Progress Of Aircraft Diesel

■ *Philadelphia*

"The major obstacle preventing the diesel from definitely asserting itself over the gasoline engine seems to be its inherent inability to utilize the full air charge," was the contention of F. Masi, research engineer, National Supply Co., Superior Diesel Engine Division, in the presentation of his paper, "The Progress of the Aircraft Diesel," before the Philadelphia Section, Nov. 13.

"As soon as this problem is solved," Mr. Masi continued, "the diesel at one stroke becomes a very serious competitor of the gasoline engine." That the solution may not be very far off was indicated by Mr. Masi when he stated, "A step in this direction was taken by the government-sponsored investigation at Pennsylvania State College to determine the possibilities of oxygen supercharging for short periods of maximum power operation, as in take off. The idea investigated proposed the use of liquid oxygen to fortify the air charge. Prof. Schweitzer under whose direction the tests were conducted, issued a verbal report early this year on the results of the tests. He stated that power increase in the vicinity of 40% had been obtained by this method with comparatively little increase in the maximum pressure. It would seem," Mr. Masi said, "as though little effort is needed to make this method practicable."

(*News of Society concluded on page* 36)

ANNUAL MEETING EXTRA:
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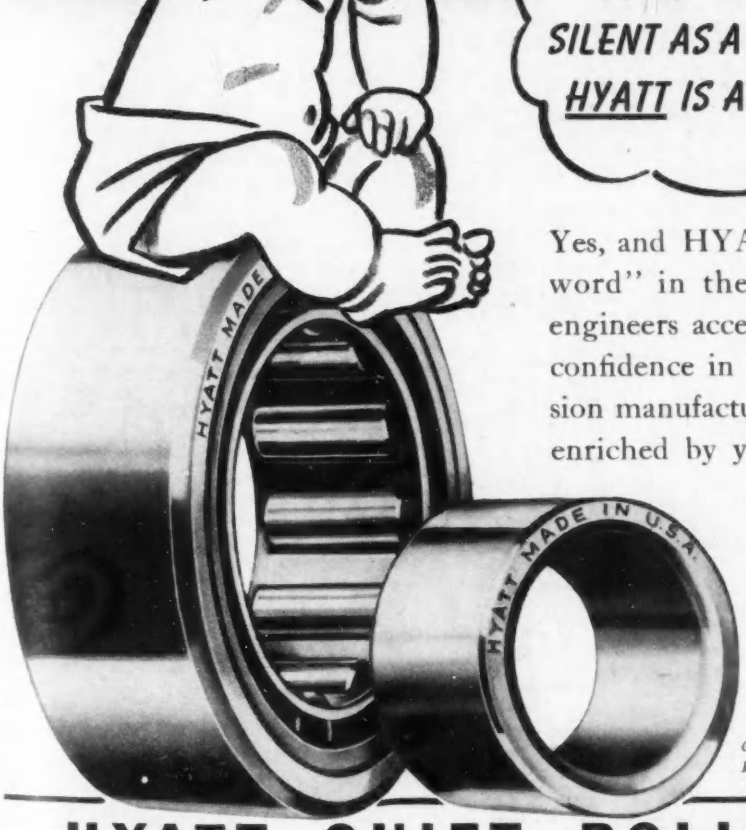


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**HYATT QUIET ROLLER BEARINGS**

(*News of Society concluded from page 34*)

Although rapid development of gasoline aircraft engines has left the diesel little to boast about, Mr. Masi commented, the very real advantages possessed by the diesel in the matter of reduction of fire hazard, simplicity of design and operation, and other advantages of lesser importance are sufficient in themselves to justify further development of the diesel engine.

"As indicated by the unquestionable excellence of our gasoline engine," Mr. Masi said in closing, "America can, by proper coordination of the ingenuity of its engine designers and adequate financial encouragement, produce aircraft diesel engines of equal or superior merit than those of any other country. I hope that such designs will materialize very soon."

## Vehicle Suspension Development Traced

**■ Pittsburgh**

"Some Fundamentals of Spring Suspension" was the topic taken by N. E. Hendrickson, vice president and chief engineer, Mather Spring Co., in his talk before the Pittsburgh Section, Nov. 28.

The utility of vehicle suspension springs, he pointed out early in his paper, lies in the fact that they insulate passengers from rapid up-and-down motions, because people cannot be comfortable when they are exposed to sudden movements; that is, movements of high frequency.

The problem of suspension, he stated, is that of getting high deflections without excessive weight. Suspension springs are at work all the time – operating under a varying range of stress – a range much broader than valve springs operate under, he explained.

After discussing development and research work that has resulted in present-day suspension, Mr. Hendrickson devoted the closing paragraphs of his paper to the effect of weight distribution on riding comfort.

## Vapor-Phase Cooling Explained by Wallace

**■ Tulsa Group**

"Vapor-Phase" cooling, described as an extremely simple means of automatically maintaining constant high jacket water temperatures, making possible important savings to operators of internal-combustion engines through reduction of engine wear, repairs, and replacements, and reductions in consumption of fuels and lubricants was explained by J. H. Wallace, chief engineer, Pacific Enterprise Products, Inc., at the October meeting of the SAE Group of Tulsa.

Mr. Wallace, who played a large part in the design of vapor-phase equipment, described the various types of high-temperature cooling systems. In the vapor-phase cooling system, he said, circulation is maintained through the jacket of the engine, and steam is removed at a central point where it is condensed and returned to the system. Most of the heat of the engine, he explained, is carried out in the form of water and minute steam bubbles and the heat subsequently removed from the system in a condenser or heat exchanger. The name "vapor phase" comes from the fact that the heat is removed in the vapor phase of the fluid by changing the state of the fluid from vapor to liquid, he said.

Buda Engine Service of Tulsa, Inc., was host to some 176 members and guests of the Group at a buffet dinner preceding the meeting.

## Mechanical Features of 1941 Models Analyzed

**■ Indiana**

More than 100 members and guests of the Indiana Section turned out Nov. 14 to hear Joseph Geschelin, Detroit editor of *Automotive Industries,* analyze the "New Elements of Mechanical Design in 1941 Cars." Emphasizing that the motor car industry has made great strides in its offerings for 1941, he declared that advancements in mechanical design are far greater than is evident on the surface, although anyone interested in automobiles is bound to be impressed with the smart styling, richly tailored interiors, and colorful finish so characteristic of the new models.

Examining new mechanical features of each 1941 car, Mr. Geschelin reiterated many of the points made in his talk on the new models before the Cleveland Section on Nov. 11, which was reported on page 18 of the December SAE Journal.

Taking part in the discussion of Mr. Geschelin's paper were Col. A. W. S. Herrington, George L. Brinkworth, Lee Oldfield, Prof. H. M. Jacklin, and others.

## Paton Tells Students Car Designers' Problems

**■ U. of Michigan**

Packard car designers have one of the most difficult assignments in the field, Clyde Paton, chief engineer, Packard Motor Car Co., told members of the SAE Student Branch, Nov. 28, at his Alma Mater, the University of Michigan. Their task, on one hand, he said, is to retain the traditional characteristics which both distinguish the Packard car and protect its owners from design obsolescence and, at the same time, keep pace with the style trends of the industry, so that the Packard will not appear old fashioned in comparison with offerings of other manufacturers.

The importance of sales and market analysis in the conception of new designs was stressed by Mr. Paton. He described the pre-production period from the preparation of styling sketches and quarter-size models, to the final production release. Releasing, he told the students, always entails an element of gambling. Because of the invariable occurrence of unpredictable difficulties in development, he said, test information is seldom complete when the releasing date arrives. The relentless pressure of competition in the industry, he added, prohibits delay in starting production, so the engineer must often exercise judgment concerning the adoption of features whose performance is not experimentally guaranteed.

During the discussion period Mr. Paton traced the development of air-conditioning equipment for automobiles. It was with difficulty that the flow of questions from the 80 members and guests present was cut off when time came for adjournment.

Earlier in the month the Student Branch convened with student members of the Institute of the Aeronautical Sciences and students of the Civil Pilot's Training Course to hear I. E. Flaa of the Ethyl Gasoline Corp. discuss "Gasoline and Combustion." For demonstration purposes, Mr. Flaa induced a state of knocking combustion in a glass cylinder. He pointed out how prevention of detonation made possible the use of high compression ratios in gasoline engines. Thus, he explained, power output may be materially increased without imposing severe impact loads on the moving elements of the engine. Mr. Flaa was assisted in the demonstration by F. J. Schroeter, also of Ethyl. Following the talk, supplementary sound motion pictures were shown.

## Colorado Club Meets

Thirty members of the SAE Club of Colorado met Dec. 12 to hear W. H. Hauselmann, Hauselmann Experimental Laboratory, Denver, speak on "Two-Cycle Engines." Mr. Hauselmann supplemented his talk with a demonstration of power-output and fuel-consumption testing on a twin-cylinder radial-type 2-cycle supercharged engine. The meeting was held at the Hauselmann Laboratory.

## About Authors

(*Concluded from page 11*)

***B.S. degree at M.I.T. Graduating in 1918, he entered the U.S. Navy as an ensign, and soon was made assistant to the officer in charge of the aeronautical-engine test laboratory at the Washington Navy Yard. The war over, Mr. Pope worked for a while at Nash, then established his own automotive sales and service business in Kenosha, Wis. In 1923 he joined Waukesha, advancing to his present position in 1926. He represented the Diesel-Engine Engineering Activity as SAE vice president in 1937, has served as chairman of the Milwaukee Section, and holds membership on a number of SAE research commitees.***

***■ Engaged in the automotive industry for about 30 years,*** **C. R. STAUB** ***(M '26) has devoted most of his time to the gear field. For the past 11 years, he has been chief engineer of the Michigan Tool Co., whose specialty is gear-cutting tools and gear-shaving and checking equipment. He also has acted as consultant on high-speed turbine and reduction units. Prior to his affiliation with Michigan Tool, he had been doing experimental and test work on gears of all kinds in the Chrysler-Dodge transmission division. Earlier he had been connected with Borg-Warner, Ford, Hupp, and Packard.***

■ **ARTHUR F. UNDERWOOD** ***(M '30) heads mechanical engineering No. 5 at General Motors Research Laboratories, which investigate the problems of bearings, frictional characteristics of surfaces, and the mechanical factors of lubrication. He has been with GM Research Laboratories since 1926, first during the summer when a graduate student and assistant in machine design at M.I.T. while earning his S.M. degree, and afterwards on a full-time basis. He first concentrated on valve gear and camshaft problems, and later transferred his interests to investigations into the problems of oil consumption, oil stability, bearing materials and bearing design. He has designed several machines that are widely used in the petroleum and bearing industries for testing these products and has aided in the development of several new bearing materials.***